

AUTOMOTIVE INDUSTRIES

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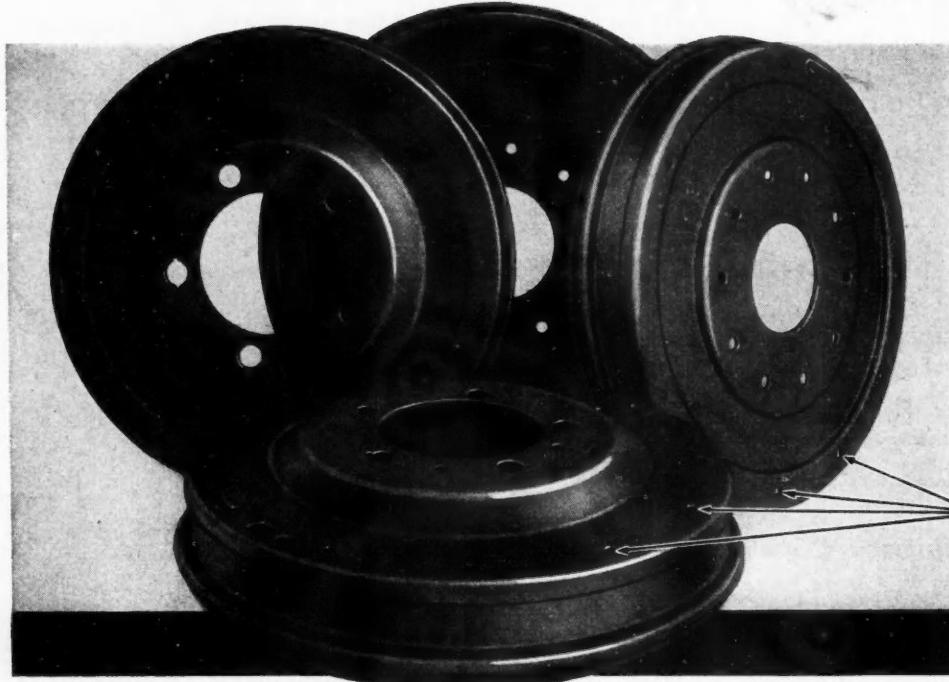
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Automotive Industries

AUTOMOTIVE INDUSTRIES

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The "fuel economy" myth must be exploded before real progress can be made in developing the automotive Diesel

Myths Hinder Diesel Growth

by Joseph Geschelin

R-R-R-rmmph! Bang!! Smoke, rocks and trunks of trees burst skyward as the blast seemed to split the heavens!

Destruction came, but the man who planned the explosion and placed the dynamite knew the way was cleared for a railroad or a new highway. Destruction is the vanguard of progress.

Thus also must the myths surrounding economic development be exploded before real development can be made.

Fanciful fairies which are popularly believed to be ruling the destinies of Diesel engines for automotive use must be scrutinized if one would peer into the future, and deep-rooted myths must be swept away before any real advance can be made in the art of high-speed Diesel engine.

The first hobgoblin doomed for scrutiny is the fuel economy fable.

Those who base their belief of a bright future in Diesel development upon the premise that high-speed oil engines will operate on crude oil, just as it comes out of the ground, are due for a shock.

Not long ago one of the most widely editorial writers told his millions of newspaper readers that the day was not far off when pipe lines from oil wells would pour fuel directly into Diesel-powered trucks and passenger cars! Friends of the Diesel—and they are many—might well lay by the heels fallacious thinking of this type which has created a rather alarming background of popular approval.

As a matter of fact, only the slow-speed, heavy-duty engines used in powerplants and for marine installations can use crude effectively.¹ Even in such types of powerplants the use of crude is giving way to somewhat refined fuels,² although the myth of "phenomenal fuel economy" has made its rounds in newspapers and technical journals.

The truth of the matter is that the well-designed Diesel of the near future has *inherent* fuel economies greater than has the gasoline engine. In other words, the *theoretical* Diesel cycle offers better economy than does the ideal gasoline engine. But when achieved in actual design, the economies will be remote from the phenomenal.

And far from running automotive Diesels on crude oil as it comes from the ground, current design demands and trends indicate that the finally preferred Diesel fuel may turn out to be a highly refined oil, perhaps processed as much as is our present gasoline.

Examine the facts and see what we find:

Many Diesels are being run on a commercial grade of fuel oil with a flash point of 150 deg. Fahr. It is a little heavier than kerosene and only slightly less refined because color and sulphur content are not so important. But most makers of high-speed Diesels are placing *additional* restrictions on fuel specifications. Perhaps the fewest restrictions are found in the recommended specifications for the Buda M.A.N., which reads:

"There is a wide range of permissible Diesel fuel oils that may be used in the Buda M.A.N. Diesel engines. It is generally thought that the Baume or specific gravity is an indication of the proper fuel to use. This is not always the case, for it depends more upon the

¹ The Diesel Engine, Its Fuel and Its Uses, by Herbert Haas, Bull. 156, Pet. Tech. No. 44, Bureau of Mines (1918).

² Oil Conservation and Fuel Oil Supply, Pub. by the National Industrial Conference Board (1930).

Fig. I. Comparison of fuel economy in tests of the A.E.C. and a comparable gasoline engine. Reported by Col. G. A. Green (see reference 5)

viscosity of the fuel at the temperature the fuel oil must flow into the fuel pump, also through the suction pipe and screens.

"The fuel pump must at all times be able to draw in a complete charge of solid fuel oil freely (no air or water tolerated). It is advisable to have some pressure on the supply line to the fuel pump. The bottom of the fuel tank should not be less than 3 ft. above the top of the fuel pump.

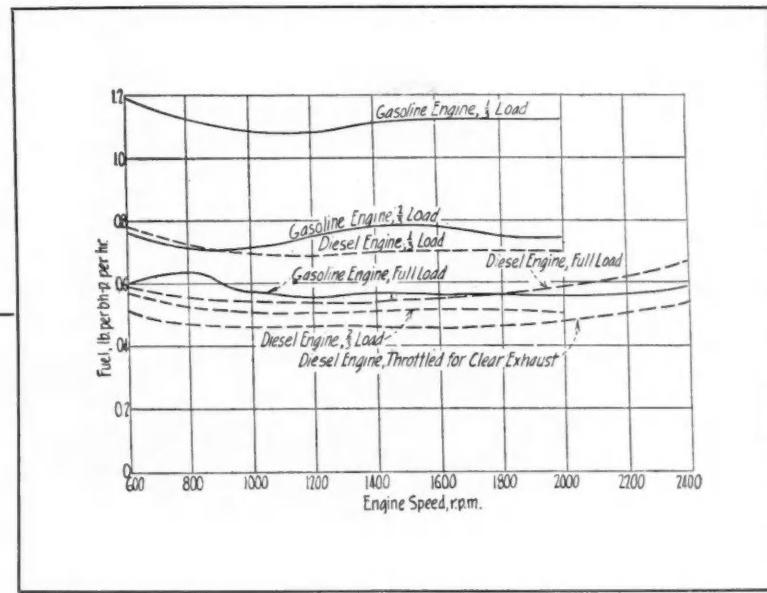
"The finest screen used in the Buda fuel oil filter is of 200 mesh and the fuel oil must be able to flow through this screen during the lowest atmospheric temperature that the engine may be operated in. Therefore, any fuel oil that will flow through the finest screen used on into the pump uninterruptedly under all atmospheric operating temperature conditions is satisfactory.

"As a guide for fuel oil for average conditions, any fuel oil having a Baume of 26 deg. to 38 deg. should be satisfactory, providing the cold test is such that the fuel oil will pour and flow freely under the lowest operating temperatures encountered and comply with the conditions mentioned above.

"It is advisable to use the lower Baume fuel oils, as they possess greater lubricating qualities, which reduce the wear on the close-fitting fuel pump parts to a minimum. Avoid using any fuel above 38 deg. Baume for new engines or for any great length of time for older engines on account of the low lubricating value, and thereby prevent possible scoring of pump plunger and valve guides."

Commercial fuel oil, already widely distributed, would be the most economical fuel for Diesels. At present, however, this fuel costs only about three cents less per gallon than gasoline in bulk.

Published material indicates that designers of high-speed automotive Diesels are looking to special fuels for the solution of many troublesome problems presented by engines designed to run at speeds exceeding 2500 r.p.m. Minute particles of fuel must be metered accurately within the briefest possible inter-



Theoretically, Diesels offer better fuel economy than gasoline engines, but when achieved in actual design the economies of automotive Diesels will be remote from the phenomenal

val. For automotive purposes fuel is injected ahead of top dead center, with the result that volatile elements must be held down to avoid preignition and at the same time the heavier components must be held down to avoid detonation. Thus it can be seen that the preferred automotive Diesel fuel for the future is likely to be a highly refined product.

Henry M. Crane³, dean of General Motors engineers, strongly reflects this opinion. Recently he said: "Automotive engineers should investigate the actual fuel requirements of a small, high-speed Diesel engine. The ideas of otherwise intelligent people on this subject are astounding. Roger Babson, for instance, told me within one and a half years ago that he understood that Diesel engines run on crude oil, just as it comes from the ground, regardless of its source and the amount of sand it contains. As a matter of fact, there is some reason to believe that the limitations of fuel needed for the high-speed Diesel engine may require an even higher grade of refining process than is required for motor gasoline."

Incidentally, the special Diesel fuels demand a narrower distillation range than the finest gasolines on the market, and undoubtedly would cost considerably more even if used in reasonable quantities. An effort to create a standardized program on Diesel fuels has resulted in an American Society of Testing Materials Committee, with representatives of the American Petroleum Institute cooperating, to tackle the problem for the petroleum industry with the hope of clarifying the matter to some extent.

With these prevalent myths swept away, then, let us consider the positive fuel economy of the Diesel. And such consideration can bring only a high regard for the practical possibilities which development of this type of engine opens up. To begin with—as mentioned previously—the perfect Diesel cycle is superior to the gasoline type in thermal efficiency, can burn fuel more economically and efficiently and consequently can produce a given output with less fuel.

Actually, it should achieve a fuel economy of about 0.35 lb. per b.h.p. hr. as compared with 0.65 lb. per b.h.p. hr. for the gasoline engine. How far this may



be realized in practice depends upon improvements in design. Current engines show figures ranging from 0.40 to 0.50 lb. per b.h.p. hr. A. A. Lyman⁴ reported economy of 0.50 to 0.60. Fig. 1 shows results demonstrated by Colonel Green⁵ in testing an A.E.C. engine on bus trials. These figures are for full-load operation.

But the greatest economy comes from the fact that the Diesel has practically a flat fuel consumption curve. The significance of this is that it takes very little more fuel at part load, whereas the gasoline engine burns almost 50 per cent more fuel under these conditions. Now, since most transportation service is on part load, the operating economy takes another jump. This does not apply to aircraft, marine, or stationary work, which is practically full load all the time; here the comparison is to be made on the basis of full-load economy alone.

Still another significant saving in favor of the Diesels, assuming the use of present commercial fuel oils, is that the fuel is heavier, weighs more per gallon, and has a correspondingly higher heat value. This is illustrated in Table I. If we compare a furnace oil with gasoline, we find that a gallon of furnace oil has about 12 per cent more heating value in B.t.u.'s; crude oil is still better in this respect.

Combining the ideally possible economies, we find the possibility of achieving a saving of 35 to 60 per cent in fuel consumption (by volume), depending upon the load factor. The following report of the Department of Commerce shows some operating figures abroad which are pertinent in this respect:

³ Diesel Engines Evaluated, by H. M. Crane. S.A.E. Jour., July, 1931.

⁴ Diesel-Engine Motorcoach Operation and Maintenance, by A. A. Lyman. S.A.E. Jour., March, 1931.

⁵ Commercial Applications of Diesel Engines in Heavy-Duty Motorcoaches and Trucks, by Col. G. A. Green. S.A.E. Jour., Feb. 1932.

Table I shows another angle of the economy of Diesel operation. It is evident that if a commercial fuel oil is used, it is heavier, weighs more per gallon, and has a higher heat value. Compared with gasoline it has about 12 per cent more B.t.u's

"The importation early in December (1931) into Shanghai of the first Diesel 'Renault' heavy-duty truck has created considerable public

interest. Demonstration runs of this 4-ton commercial vehicle have been featured for both foreign and Chinese visitors. Advantageous features which have been stressed in this campaign are: low fuel cost, minimum maintenance cost, sturdiness and durability, and ease and safety of control. The low fuel cost feature is one of primary importance to motor truck and bus users in China. The agents for this Diesel-Renault claim for it a 79 per cent saving as compared with gasoline-using vehicles. If this Diesel truck is furnished in light-duty weights it may find an encouraging market in China on account of the low fuel cost.

"A report dated April 3, 1931, from our Paris office subject 'Saurer Bus With Diesel Engine Establishes Low Cost Fuel Record in Paris-Nice Trip': 'A 4-cylinder Saurer bus equipped with 4.1-liter Diesel engine broke all records for low-cost fuel consumption in the 1000-kilometer Paris-Nice trip, it is claimed by the company. The bus used 198 liters of oil at a cost of 52 centimes a liter. According to our system of weights and measures, the amount of fuel used was 43.5 gallons at a cost of about 7.8 cents a gallon. The point emphasized by the Saurer Company is the fact that this bus carried 13 passengers and a large amount of baggage, and pro-rating the fuel charges, the cost per passenger was only 7.92 francs, or about 31 cents."

The only acceptable basis for figuring full costs is to compare oil fuel and gasoline on prevailing bulk prices. Some early figures have shown a comparison between premium gasoline at pump prices with the cheapest grades of fuel oil in bulk. This type of computation can't possibly help the Diesel industry.

However, one of the most important elements in the price situation seems to have been overlooked entirely, except by a few individuals like Col. G. A. Green, who are doing their bit to put the thing on a sound basis—that's the matter of fuel tax. And it's a mighty important consideration, for, according to the 1932 Statistical Issue of *Automotive Industries*, ten states have a gasoline tax of 5 cents; five, 6 cents; sixteen, 4 cents; nine, 3 cents; and the rest 2 cents. Florida has a tax of 7 cents, while Mississippi has a tax of 5½ cents.

It is simply a delusion to expect that fuel oil will be tax-free if and when the automotive Diesel makes its appearance in some numbers on the highways. Legislators will not brook a depreciation in revenue in this lucrative field. If tax is taken into account,

Table I*

| Fuel | Specific Gravity | Wgt. (lb.)/gal. | B.t.u./lb.** | B.t.u./gal.** |
|--------------------|------------------|-----------------|--------------|---------------|
| Gasoline | 0.739 | 6.16 | 18,900 | 116,400 |
| Fuel oil (furnace) | 0.85 | 7.1 | 18,390 | 130,300 |
| Crude oil | 0.96 | 8.0 | 17,790 | 142,300 |

*From "Thermal Properties of Petroleum Products." Bureau of Standards Miscl. Pub. No. 97.

**Net heat—lower calorific value.

the prices of fuel oil and gasoline get closer together. Of course, the present disparity in price due to the tax differential is very attractive and is an important factor in business abroad as evidenced by the following Department of Commerce report:

"Some of the oil dealers in the Netherlands are receiving increased inquiries for Diesel-engine fuel, which indicates possible development in the use of this motor for trucks and buses. Up to the present this type of equipment has not made much progress in the Netherlands, although it is reported as being in considerable use in Germany. Local distributors of the M.A.N. (German) are featuring this company's Diesel motor products in connection with the proposed gasoline tax."

Unless we know the actual facts from the refiners' point of view, pure logic is likely to lead to false conclusions. Too many people have argued and predicted dire results in the event that there is a heavy demand for Diesel fuel. What are the facts?

Today there exists a condition of over-supply of crude oil. This was not the case some years back. Moreover, new sources of gasoline have appeared; the first is the development of new refining methods such as cracking and hydrogenation; the other is the tapping of natural gas sources which promise a generous addition to the available gasoline supply.

Another element is flexibility of the refining plant. Given sufficient time, the refiner can produce any kind of fuel that may be demanded. To take an absurd illustration, if the demand suddenly shifted from gasoline to Diesel fuel, refiners could in all probability make the changeover in less than a year.

But, considering that in round figures 1931 registration was 23,000,000 passenger cars and 3,500,000 trucks, is it conceivable that these enormous totals could be converted into Diesels in one fell swoop or even a couple of fell swoops?

Boiling it down still more, we may assume that for the present Diesel development might well be restricted to only the heavy duty units in road and air transport, as well as marine and stationary applications. This brings us down to the annual increments comprising replacements and additions. Taken over a period of six years, the total yearly growth in the truck field is 400,000 units. Of this only 8.4 per cent

(Turn to page 591, please).

JUST AMONG OURSELVES

Prices Will be Firm

LAST week in an article about shimmying car prices, we expressed the belief that there would be no sense to price reductions on cars above the lowest price class, but that some observers thought a kind of price cut hysteria might easily sweep the whole industry.

After writing that article we went to Detroit and points West, there to spend a week and converse informally with executives of many plants. We came back firmly convinced of the industry's sanity. Prices, we now feel fairly sure, are not going to nose dive. While nothing is certain in the automobile business these days, we're pretty well convinced that General Motors isn't contemplating any further cuts and there is certainly no tendency on the part of other middle and high priced makers to start anything. Higher rather than lower prices are predicted.

With Parts Prices Steady

THE most important effect of this price stability, we believe, will be on the parts makers and raw material suppliers. At least it should mean the avoidance of further chiseling-bees at this time.

Chief engineer of one big car company said: "There's even some evidence of stiffening of prices among the parts makers . . . and I think it's a good thing. We can't get back to prosperity until somebody begins to make

some money out of something."

Almost every company subscribes to that theory, but none are going to go around asking for a chance to pay more for materials and supplies. Chiseling has not ceased. But price stability in the passenger car field means less chiseling—and that's something to be thankful for in these dark days.

A Million and One Little Things That—

NO man can spend years in the business of seeking information and writing articles without coming to appreciate how difficult it is to dramatize those features of business operation which actually have most to do with success. And since a certain amount of drama is needed to make any article readable, the result is that dramatic things and dramatic incidents often are given public credit for achieving glories which really were accomplished by just a million small things done right.

Most executives when interviewed, recognizing this fact subconsciously at least, tend to rationalize considerably about the factors making for success. It's human and natural to do so; particularly when the interviewer is pressing for just such rationalizing. Some men are different, to be sure. They just can't get around to kidding themselves. Interviewed by the representative of an important national magazine recently, the president of a highly successful refrigerator company failed to provide his interviewer with a

"story" and his company with publicity because he stuck like grim death to the hum-drum fact that his company's success had been built, not by any special tricks or features, but by consistent application of sound methods to every detail of management.

"When the interviewer left," this president told us, "I think he had the feeling that any success we have had was largely a matter of accident. Maybe he is right, but when a job has been done as the result of coordinated activities extending over a period of almost three years, the outcome is the net of all the forces set in motion; and while one can in retrospect do a lot of rationalizing, the last man in the world who should do that sort of thing is the fellow who has lived on the job every day and just done a million and one little things that finally have resulted in a relatively spectacular showing.

"I am afraid that such sordid and everyday things will not make an interesting feature story, because magazine readers, it seems, are looking for a panacea. It happens that manufacturing organizations are not built and maintained by brain-staggering stunts and pulling rabbits out of hats."

Here is One for the Notebook

Nin the midst of many wild and woolly statements made by Maurice Holland at the last annual meeting of the S.A.E., one sentence stood out to us as being sound and pertinent. Hence we are going to pass it on. Here it is:

"Cooperative research must have for its purpose a utilitarian objective, but this should not be confused with undertaking practical problems involving so many variables that they cannot be definitely controlled."—N.G.S.

Fords Bristle With Trick

by
P. M.
Heldt



Henry Ford inspects
the new V-8 engine

HEREWITH *Automotive Industries* presents the third of a series of descriptions of salient features of the new Ford V-8 and the improved Four. These mechanical details, released this week by the Ford Motor Co., complete the story of the new cars to date.

On the V-8 the arrangement of the accessories has been worked out with great care, and the engine presents an unusually clean appearance. Cylinder banks are both integral with the crankcase and are offset relative to each other to permit of side-by-side mounting of the connecting rods. Moreover—what is new in Vee engines—their axes are offset 3/16 in. with respect to the crankshaft axis.

Considerable originality is reflected also by the design of the cylinder blocks. Instead of following conventional practice for L-head engines, the inlet port outlets only are on the inside of the V. The face of the inlet ports of both banks is horizontal, instead of being parallel to the cylinder axes, thus preventing a flat surface across the top of the engine for the attachment of the inlet manifold. Ports are individual for each cylinder. The exhaust valve ports are cored through the cylinder water jackets (around both ends

and through the center) to exhaust manifolds on the outside of the banks near the chassis frame members. The exhaust pipe from the left bank is carried around the front of the engine pan, where it is siamesed with the pipe from the right bank before entering the muffler. By bringing the inlet ports to a horizontal face on the top of the blocks, and carrying the exhaust ports through them, the valley between the banks is left entirely clear. Both ends of the valley are closed by lips cast integral with the block. These are brought to the same level as the inlet port face, completely inclosing the valve chamber when an aluminum top cover (with the inlet manifold integral) is in position. The inlet manifold passages are siamesed into a single center inlet from the eight ports on top



Athel Denham Photo

View of cylinder head from underneath
showing form of combustion chambers

Design and Mechanical Innovations

The offset connecting rod axes, for example, are new in a Vee engine; the face of the inlet ports in both cylinder banks is horizontal; the exhaust valve ports are cored through the cylinder water jackets, which points to successful solution of intricate foundry problems

of the cylinder block and are cored into the under side of the cover, the outside surface of which is slightly crowned between the cylinder heads. Both intake manifold passages and valve ports are machined, to reduce resistance to mixture flow. The cover is held in place by bolts, with a gasket between it and the block. Access to the valves is made possible by removing the combination manifold and cover and the components mounted on it. On top of the cover are mounted the downdraft carburetor, combination breather and oil filler, and the fuel pump.

One of the most important developments from the standpoint of simplicity is in the design of the valve-operating mechanism. By locating the camshaft high in the crankcase and inclining the valves at a slight angle with the cylinder bores, it has been rendered unnecessary to utilize any form of valve-operating linkage. Valves are non-adjustable and have mushroom ends. The tappets are hollow, with hardened flat bottom and top tapering to a diameter equal to that of the mushroom end of the valve stem. In order to insert

and remove the valves, a split valve guide, slightly larger in diameter than the mushroom end, is used. The lower end of the spring is held in place by a split disk which bears upon the curved portion of the valve just above the mushroom end. The valleys between cylinder banks are open to the crankcase, and adequate lubrication of the valve stems and tappets is thus assured.

All main bearings are of babbitt, the upper halves being backed up by the cast iron of the block, and the lower by the steel of the bearing cap. A split, steel-backed bushing surrounds each crankpin. This bushing is babbitted both inside and out, and there is no babbitt in the big end of the connecting rod. Connecting rods are of the I-section type, with integral studs, and all of them are interchangeable.

The camshaft is supported on three bearings directly on the cast iron of the block. An eccentric in the rear bearing operates the fuel pump, and a gear on the end of the shaft drives the oil pump vertical shaft through an idler gear. The oil pump is thus slightly offset from

Ford "Scoop"

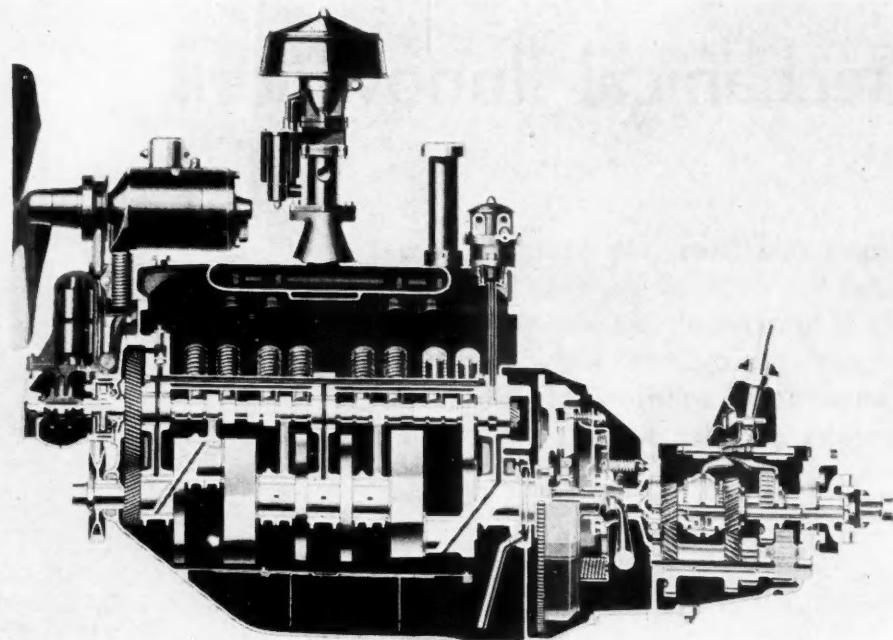
"MAKE an EIGHT, says FORD," an article by Athel F. Denham, field editor, AUTOMOTIVE INDUSTRIES (Dec. 19, 1931), told the first authoritative story of plans for the new Ford Eight and Four.

For months fantastic Ford rumors were spread all over the world. AUTOMOTIVE INDUSTRIES, however, published facts only.

During the week when the new cars were shown exclusively to the Ford dealers, AUTOMOTIVE INDUSTRIES published the first description of the new V-Eight (April 2, 1932).

Last week we augmented the preliminary description with exclusive photographs of the chassis and engine, exclusive specifications and an analysis of the engine by P. M. Heldt, dean of automotive engineering writers.

This week we present this, the third of this series of actual descriptions, augmenting and completing our coverage of the new Ford V-Eight and Four to date.



Vertical longitudinal section through power-plant. Notice inlet manifold combined with cylinder block cover

the center line of the crankshaft. The camshaft is driven by a helical gear of bakelized material. The front end of the shaft extends through the timing gear cover, where a slot in its end meshes with the ignition distributor driveshaft.

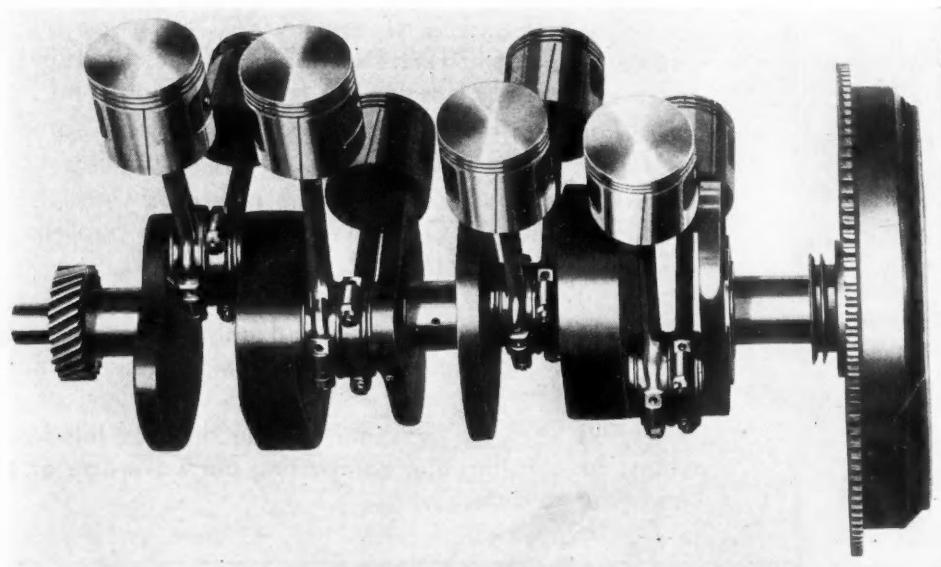
The ignition distributor is of unique design, completely inclosed in an aluminum housing. Two sets of ignition contact points are employed, operating through a single coil mounted on top of the aluminum housing. The secondary lead from the coil extends directly into the inclosed distributor, hence is not exposed; nor are any of the cables to the spark plugs exposed until a few inches from them. The cables to the two banks of cylinders pass through covers on each side of the distributor housing, and thence through rubber ferrules into the cable manifolds, from which a short lead extends to each spark plug. Full automatic spark control is effected by means of the vacuum in the inlet manifold.

The fuel pump is provided with a sediment trap and a fuel filter. The carburetor has an accelerator pump and a power jet. A cored passage in the intake manifold cover plate permits exhaust gas to surge back and forth between the banks of cylinders, to supply heat to the incoming fuel mixture. The rear fuel tank is made of terne plate, electrically seam-welded, and is exceptionally rugged.

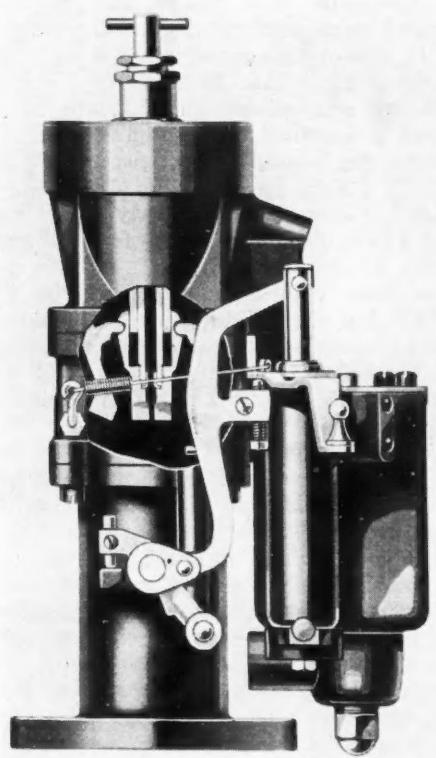
Engine mounting is of

the three-point type, with two points in front and one at the rear. The front support is through a bracket rigidly fastened to the engine block, the ends of which rest upon rubber "biscuits." The rubber is vulcanized to a steel ring bolted to the frame front cross-member. The brackets are secured to the tops of the "biscuits" by bolts screwed into tapped bushings vulcanized into the rubber. The single-point rear mounting is through a steel ring having a rubber ring vulcanized to it, the ring being bolted to the front side of the frame center cross-member. The rear end of the transmission and the front end of the torque-tube or universal-joint housing are bolted together through the compound steel and rubber ring. Thus rubber in compression is interposed between the engine, the torque tube and the chassis frame.

Two engine radius rods are located on opposite sides of the engine. Their rear ends are securely bolted to

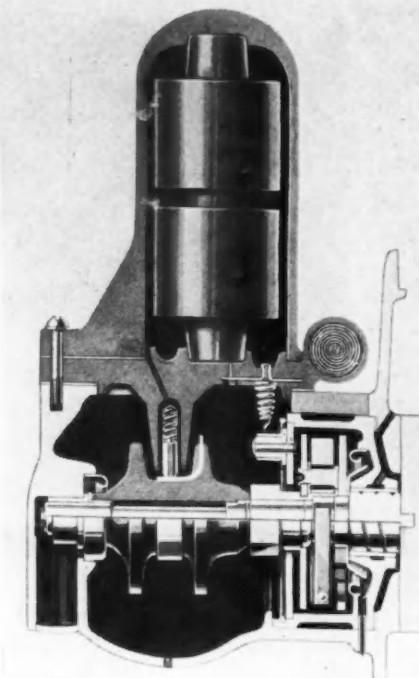


The three-bearing crankshaft is counterbalanced on every arm



Sectioned view of downdraft carburetor with accelerating pump

Right — Interrupter, distributor and coil combined in one unit



the center cross-member of the frame, while their forward ends are attached to bosses on the rear of each cylinder block. The forward ends are threaded and held in position with nuts. These radius rods evidently relieve the rubber mountings of driving-thrust stresses.

By the use of a double-drop frame in conjunction with the location of the transverse rear spring back of the axle it has been possible to lower the frame height nearly 2 in.

The frame, which has a maximum depth of section of 6 in., has five cross-members, of which three are pressed-steel members, located respectively under the radiator, at the rear of the transmission and under the rear of the body; while two are tubular, one being located at the extreme forward end of the frame, while the other is at the rear and serves also as a tire carrier bracket when the spare tire is mounted at the rear. When fender wells are supplied the rear cross member is replaced by a straight tube extending from one frame side rail to the other.

The front axle, which is of the usual I-section type, now has a positive camber (backward tilt) of $8\frac{3}{4}$ deg., as compared with 5 deg. in the Model A. Wheel camber is 2 deg. The front spring now has 11 leaves and is flatter than in the previous model.

The new wheel sizes have been given already. The wheels now have 32 instead of 30 spokes, and owing to the greater number and smaller length of spokes, they are now made of $\frac{7}{32}$ instead of $\frac{1}{4}$ in. diameter. A reduction in the depth of gutter in the wheel rim is said to make it less likely that the tire will come off the rim when suddenly deflated.

All of the bearings in the transmission with the exception of that on the reverse idler are anti-friction bearings.

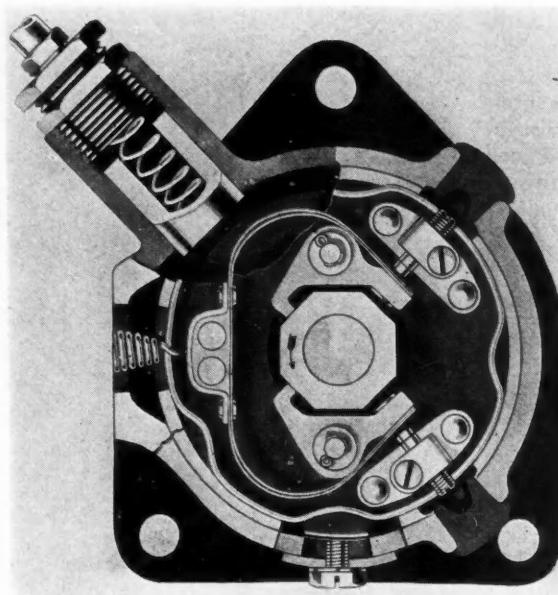
Single brake drums are now employed on both front

and rear wheels and the brake lever operates the same brakes as the brake pedal. The brake layout is such that approximately 60 per cent of the braking effort is applied to the rear brakes. The brake drums are now of iron, with two cooling fins on each drum, one of the fins also acting as a dust shield. In the front wheels the brake drum and wheel hub are integral and made of malleable iron. Alloy cast iron is the material of the rear brake drums. The brake drum diameter has been increased from 11 to 12 in., giving a total braking area of 186 sq. in. or 10 per cent more than on the Model A. The lining material is a woven composition. The braking mechanism of each wheel is mounted on a steel plate and all parts are cadmium-plated.

Transmission ratios are as follows: Low forward, 2.82:1; intermediate, 1.604:1; reverse, 3.383:1. The ratio of the steering gear is the same as in Model A, viz., 13 to 1, but the steering arm has been shortened about 20 per cent., which is equivalent to an increase in the steering-gear ratio. The included angle of the sector teeth has been increased from 40 to 52 deg., which, together with a change from two to three sector teeth, has increased the wearing surface materially. The worm is mounted in two roller bearings. Rubber pads are interposed between the steering column and bracket.

Rubber "insulation" is extensively used in the new chassis. The spring shackle insulators are of the type in which rubber is compressed between two steel ferrules. A rubber block is inserted under each body bolt. A two-ply artificial leather anti-squeak tape is inserted between the fenders and the body, asphaltum-treated fabric between the running-boards and frame.

Mounted in the oval instrument panel within convenient reach of the driver are the throttle and choke buttons, speedometer, fuel gage, oil-pressure warning light and ammeter. The coincidental steering and ig-



Cross section through ignition unit
showing two breaker arms

nition lock is attached to the steering column just in front of the panel. In the V-8 the panel is chromium plated and finished with a machine turned effect. A feature of the design of the instrument panel is that it is assembled integral with the dash and chassis, so that the body may be removed without disturbing any of the instruments or wiring under the cowl. The lever controlling the lights is mounted on top of the steering column just under the horn button. The instrument panel is indirectly lighted. Whenever any of the lamps are turned on, the panel is automatically illuminated. The accelerator pedal is of the treadle type, and the clutch and brake pedal pads are now round and are rubber covered. The starter button is located on the toe-board.

Rustless steel is used for various parts of the car.

In addition to the lamps, it is utilized for many of the smaller exposed parts and moldings. The outside body hardware is also of this material.

The rear gasoline tank has the filler cap located on the left side for convenience in complete filling when the roadway is crowned. The muffler is of the "straight through" perforated tube type with 2 in. inlet opening.

While attention has been directed chiefly to the V-8, important changes have been made in the four-cylinder model, now known as the Model B.

Cylinder dimensions remain the same ($3\frac{7}{8}$ by $4\frac{1}{4}$ in., 200, 5 cu. in.), but the cylinders are now lapped and polished. By increasing the carburetor size from 1 in. to $1\frac{1}{4}$ in., the valve lift from 0.276 to 0.319 in., and the compression ratio from 4.2 to around 5, it has been possible to raise the peaking speed from 2200 to 2800 r.p.m. and the horsepower from 40 to 50. The higher compression pressure (90 lb. p. sq. in.) is made possible in part by the adoption of automatic spark control. The carburetor also has been further refined and now is provided with a high-speed jet which is cut out at idling and intermediate speeds. Intake and exhaust ports are now machined, and a redesign of the muffler has materially reduced the exhaust back pressure.

Crankshaft main bearings have been increased in diameter to 2 in., crankpin bearings to $1\frac{7}{8}$ in., and the crankshaft now weighs 38 lb., or 9 lb. more than formerly. Crankshafts are now balanced both statically and dynamically, which refinement evidently was considered necessary in view of the considerably increased speed. Lubrication is now by pressure to the main and camshaft bearings, and by spray to all other wearing surfaces.

Ignition advance is completely automatic in the new model. Fuel feed to the carburetor is through a diaphragm pump, located on the right side of the engine just forward of the carburetor. The water pump, which is combined with the radiator fan, is set into the front of the cylinder head instead of into the block. The radiator is of the same general appearance as that of the V-8.

Powerplant mounting and all chassis details are in general similar to the corresponding features of the V-8, except the rear axle ratio, which is 3.77 to 1.

Comparison of Two-Door Sedans Listing Under \$700, f.o.b.

| | Chevrolet | DeSoto | Ford V-8 | Plymouth | Pontiac 6 | Rockne 65 | Willys 6-90 |
|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|------------------------------------|------------------------------------|
| Price..... | \$495 | \$695 | \$500 | \$575 | \$645 | \$595 | \$530 |
| Wheelbase..... | 109 | 112 $\frac{3}{8}$ | 106 | 112 | 114 | 110 | 113 |
| Tire Size..... | 5.25/18 | 5.25/18 | 5.25/18 | 5.25/18 | 5.25/18 | 5.25/18 | 5.25/18 |
| ENGINE | | | | | | | |
| Number of Cylinders..... | 6 | 6 | 8 | 4 | 6 | 6 | 6 |
| Bore and Stroke..... | $3\frac{5}{16} \times 3\frac{3}{4}$ | $3\frac{1}{4} \times 4\frac{1}{4}$ | $3\frac{1}{16} \times 3\frac{3}{4}$ | $3\frac{5}{8} \times 4\frac{3}{4}$ | $3\frac{5}{16} \times 3\frac{7}{8}$ | $3\frac{1}{8} \times 4\frac{1}{8}$ | $3\frac{1}{4} \times 3\frac{3}{8}$ |
| Piston Displacement..... | 193.9 | 211.5 | 221 | 196.1 | 200.4 | 189.9 | 192.9 |
| Max. Brake HP. at Spec. R.P.M. | 60-3000 | 75-3400 | 65-3400 | 56-2800 | 65-3000 | 65-3200 | 65-3400 |
| H. P. per Cu. In. | .26 | .36 | .294 | .29 | .30 | .34 | .34 |
| Engine revolutions per mile.... | 3020 | 3390 | 3180 | 3180 | 3340 | 3340 | 3380 |
| Compression ratio..... | 5.2 | 5.35 | 5.5 | 4.90 | 5.1 | 5.2 | 5.26 |
| Rear Axle Ratio..... | 4.1 | 4.62 | 4.33 | 4.33 | 4.55 | 4.55 | 4.6 |
| Weight of Two-Door Sedan..... | 2665 | 2903 | 2470 | 2770 | 2870 | 2520 | 2758 |
| Lb. per Cu. In. of Pist. Disp. | 13.7 | 13.7 | 11.2 | 14.1 | 14.3 | 13.3 | 14.3 |
| Weight per HP., empty..... | 44.5 | 38.7 | 38 | 49.5 | 44.2 | 38.8 | 42.4 |
| Loaded Weight per M. | 3415 | 3653 | 3220 | 3520 | 3620 | 3270 | 3508 |
| Weight per HP., loaded..... | 57 | 48.7 | 49.5 | 62.9 | 55.7 | 50.2 | 54 |
| Piston Speed Ft. | 1875 | 2410 | 2125 | 2375 | 2065 | 2200 | 2196 |
| Displacement Factor..... | 32.4 | 37.0 | 41.7 | 33.6 | 35.0 | 36.7 | 35.2 |

Smaller Water-Pump, Steady Engine Temperature With "Steam" Cooling

Normal operating temperature of engine reached rapidly with Rushmore system, which offers possibilities for heating car interiors in winter

S. W. RUSHMORE of Plainfield, N. J., who in 1921 originated a system of evaporative cooling (or steam cooling) for automobile engines in which both the inlet to and the outlet from the radiator were at the lower tank, has recently evolved an entirely new system which overcomes certain difficulties experienced with the earlier one. The new system is illustrated in diagram form herewith.

In the original Rushmore steam cooling system there was water only in the engine jacket and in the lower tank of the radiator. The steam entering the lower tank from the engine jacket rose in the radiator core and was condensed therein, and the condensate descended through the small passages of the core, passing the rising steam on the way. One of the difficulties with this system was that if the engine was operated under extreme conditions for a considerable length of time, the steam entering the radiator bottom tank sometimes forced all of the condensate up into the upper tank, so that the pump, which had its suction line connected to the lower tank, would run dry. This did not occur with radiators having large water passages (so-called truck-type radiators), but with these there was a disagreeable crackling noise. The trouble mentioned would not have occurred if the bottom tank could have been made large enough to hold practically all of the water in the system, since water was forced by steam from the bottom to the top tank only after the former had become filled and the entrances to the radiator core passages thus had become closed to steam, but this was impractical. A minor disadvantage of the system was that it was impossible to tell the water level, except by means of a water gage or test cocks, to the use of which motorists were unaccustomed.

In the new system use is made of the heavy surge of water between the engine jacket and the radiator to control the pump feed. A test cock is provided on the upper tank of the radiator, an inch or so above the top of the core, and the system is filled with water until it overflows through this cock. The engine jacket is then completely filled with water, but the water is not up to the outlet from the upper tank, which is located somewhat higher than the test cock. The pump, by the way, is of the gear type, the same as that used in the earlier system, and is very small as compared with the circulating pumps used on water-cooled engines.

When the engine is started up from cold, since the pump is not sufficiently tight to pump air, there is no

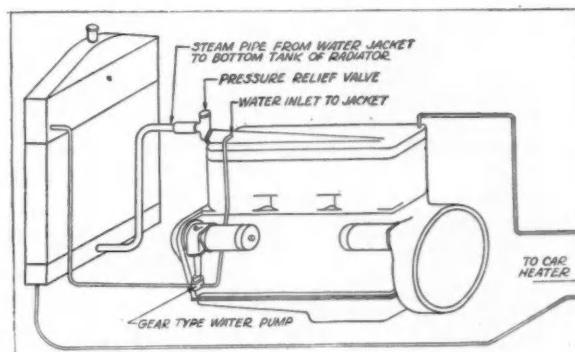


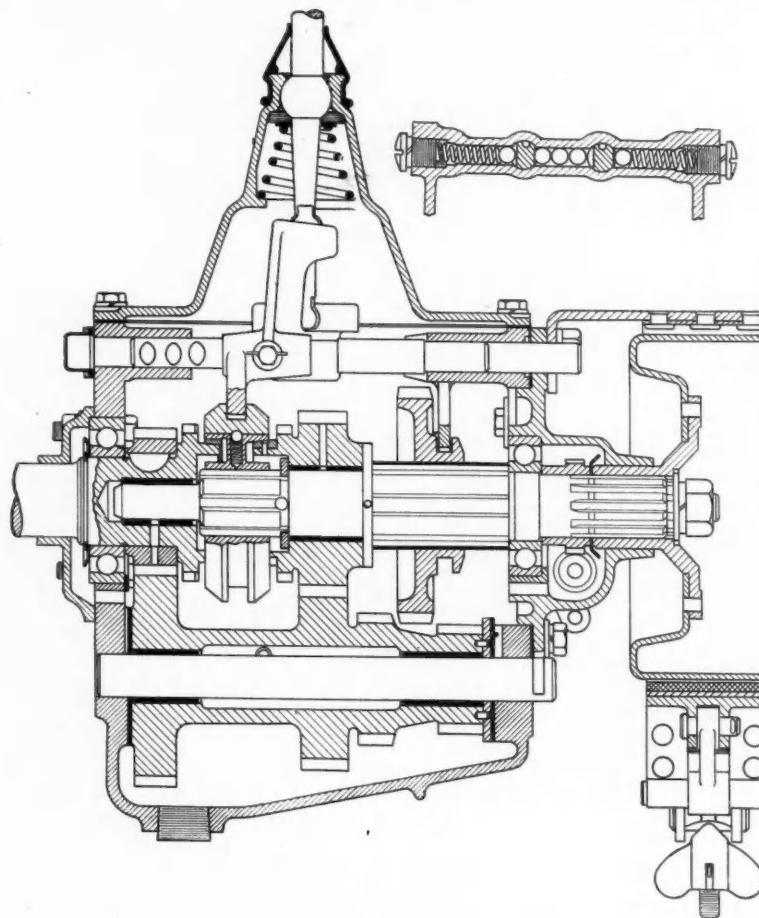
Diagram of Rushmore evaporative cooling system

circulation through the cooling system, with the result that the water in the engine jacket is brought up to the boiling point in a short time. Steam is then generated in the jacket, and steam (and some water) passes from the jacket to the bottom tank of the radiator. The immediate result is that the level of the water in the top tank rises. As soon as the water reaches the level of the outlet from the top tank, it begins to trickle into the line leading to the pump, and an important point in this connection is that the line to the pump be of considerable size, at least $\frac{1}{2}$ in. in diameter, so that it may not be air-bound. (If the pipe should become air-bound, no water would reach the pump, which latter, although it gives ample water pressure even though badly worn, will not pump air.)

The formation of steam in the engine jacket results in lifting the water level well above the outlet from the top tank, and the pump then draws water and forces it into the jacket at a rate depending upon the engine speed. How small the rate of water circulation can be in an evaporative cooling system, as compared with the customary rate in a conventional system, may be judged from the fact that the latent heat of water is 966 B.t.u. per pound, so if the water enters the jacket at, say, 34 deg. below the boiling point, every pound that is converted into steam carries with it 1000 B.t.u., whereas in the ordinary system, in which the difference between the temperatures at the jacket inlet and outlet is only about 20 deg. F., every pound of water leaving the jacket carries with it only 20 B.t.u. Thus if nothing but steam passed from the jacket to the radiator the rate of water supply to the jacket would have to be only one-fiftieth as great as

(Turn to page 597, please)

Reo Builds 6-Cyl. Flying Cloud With



by William K. Toboldt

This is a longitudinal section of the Reo transmission with synchronized shift. The detail shows the interlock between shifter bars

While the curves of the rear quarters, the sloping windshield streamlined into the roof, and the contour of the front fenders which characterized the Royale series have been retained, the V-shaped radiator grille has been given a decided slope and at the bottom is flared into the sides of the front fenders, resulting in a pleasing appearance.

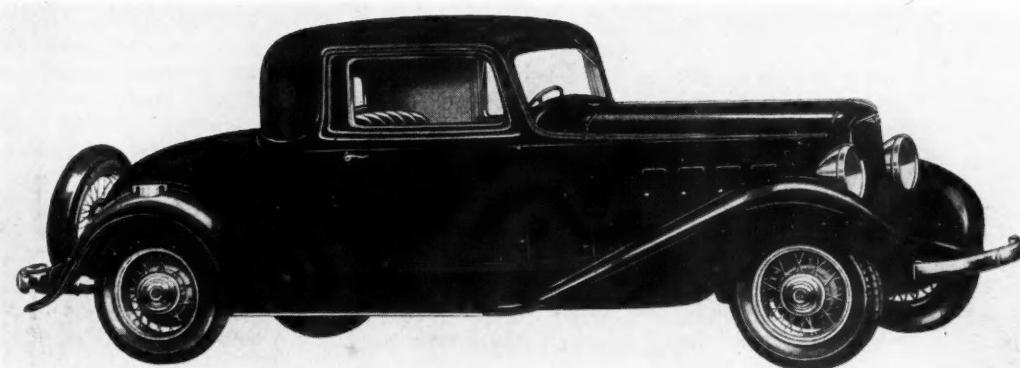
High points of the line are vacuum-operated clutch control, synchronized shift transmission, Centrifuse brake drums, downdraft carburetion, etc. De luxe equipment includes mechanical free wheeling, Startix, automatic ride control shock absorbers, non-shatterable glass in the windshield, twin horns, twin windshield wipers and special trim.

To return to the 230 cu. in. engine, the cylinder block is of chrome-nickel iron and is mounted at four points, the two at the rear being rubber, to reduce the transmission of vibration to the frame. The counterbalanced crank-shaft is mounted in seven main bearings, having a total bearing area of 87.12 sq. in., the diameter being 2 5/16 in. The shaft is machined all over, and in addition to counterbalance weights the shaft is equipped with a vibration damper.

The Lo-Ex pistons, of aluminum alloy, are fitted with four rings, three compression and one oil. The 63/64 in. wrist pins float in diamond-bored bushings

A NEW six-cylinder Reo Flying Cloud, resembling in appearance the Royale model, has been announced by the Reo Motor Car Co. Prices of the three body models which are offered at this time are—Standard Sedan \$995, Standard Coupe \$995, Sport Coupe \$1,070 and Sport Sedan \$1,070. Wheelbase is 117 in.

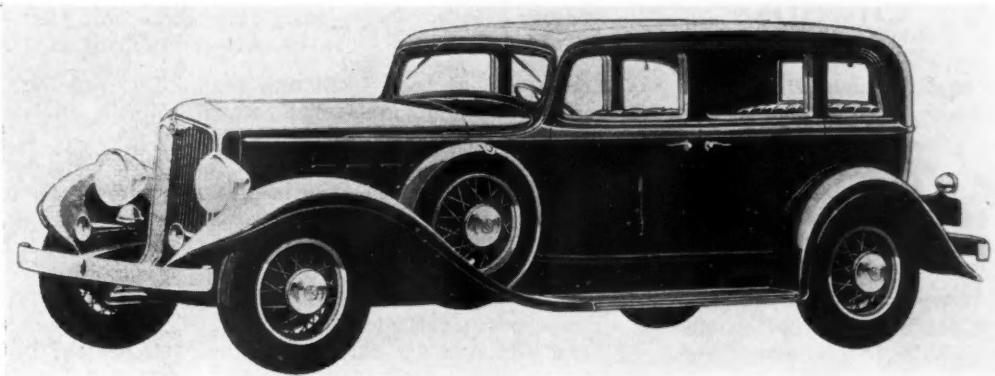
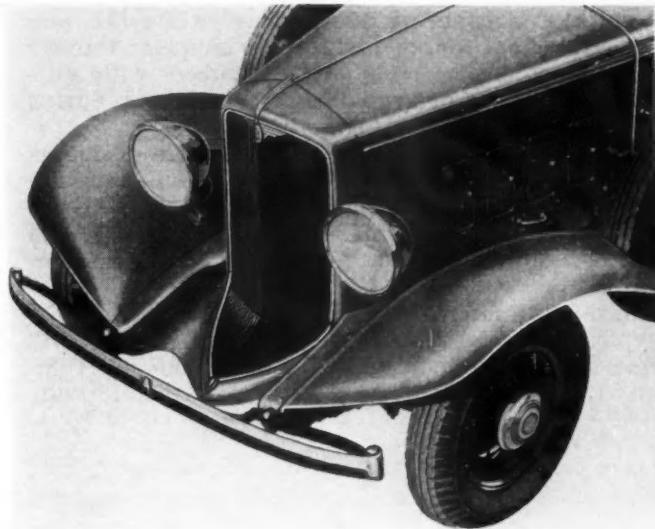
The engine of the new series has a bore and stroke of 3 1/8 in. and 5 in. respectively, and develops 80 hp. at 3200 r.p.m.



The seats of the new Reo line are adjustable. The low chassis height is attained by means of a double-drop frame

Royale Lines

The standard sedan will list at \$995 on 117 in. wheelbase car. Free wheeling, synchronizing gears, and clutch control provide smooth power transmission. Brake drums now Centrifuse type



The V-type radiator has been given a decided slope and flares into the fenders at the bottom

The bodies of the new series Reos are built for passenger comfort

in the upper end of the connecting rods. The piston bosses are also diamond bored and the pins are retained by means of snap rings. Rod bearings are of the centrifugally cast type. A gear type oil pump supplies pressure lubrication to all main, rod and camshaft bearings, the oil passing through cored passages in the block.

The carburetor is of the downdraft type and the size is $1\frac{1}{4}$ in. Fuel is supplied from the tank at the rear by means of a mechanical pump with integral filter. A combined intake silencer and air cleaner is fitted to the carburetor.

Drive to the semi-floating rear axle is through a single plate clutch, and three-speed transmission. The clutch is provided with an automatic control and is said to give smooth clutch engagement regardless of the amount the driver opens the throttle. Details of the transmission are given in one of the accompanying illustrations. This is a three-speed unit with helical gears for countershaft main drive and second speed. Shifting without clashing is provided by equalizing the speed of the mating members of jaw clutches which control second and third speeds. The free-wheel unit is of the roller type and is built into the rear of the transmission. The free-wheel control is placed on the dash.

As on other Reo models, brakes are of the internal hydraulic type and have an effective area of 137.4 sq. in. However, the new Centrifuse brake drums have been adopted for the new model S. Semi-elliptic springs are used at both front and rear,

Specifications of Model S

| | |
|--------------------------------|---|
| Wheelbase | 117 in. |
| Engine | 6 cyl. $3\frac{1}{2}$ x 5 in. |
| Piston displacement | 230 cu. in. |
| Brake horsepower | 80 hp. at 3200 r.p.m. |
| Compression ratio | 5.3 to 1 |
| No. of main bearings | 7 |
| Main bearing dia. | $2\frac{5}{16}$ in. |
| Pistons | Lo-Ex |
| No. compression rings | 3 |
| No. oil rings | 1 |
| Camshaft drive | Chain |
| Carburetor size and type | $1\frac{1}{4}$ in. downdraft |
| Engine lubrication | Full pressure |
| Clutch | Single plate with automatic control |
| Clutch facings | 9 $\frac{3}{4}$ in. outside dia. 6 $\frac{1}{2}$ in. inside dia. |
| Transmission | Three speed, helical gear, synchronized shift |
| Rear axle | Semi-floating |
| Brakes | Hydraulic |
| Brake drums | Centrifuse |
| Front springs | 39 x 2 in., 9 leaves |
| Rear springs | 55 x 2 in., 10 leaves |
| Shock absorbers | Two-way hydraulic |
| Steering gear | Cam and lever |
| Tire size standard | 5.50/17 |
| Tire size sport | 6.00/17 |
| Front tread | 59 $\frac{1}{4}$ in. |
| Rear tread | 61 in. |

the front ones being 39 in. long, while the rear measure 55 in. Riding qualities are improved through the use of double-acting shock absorbers with automatic ride control available at extra cost. Spring shackles are of the self-adjusting type.

The new bodies are built as much for the comfort of the passengers as for appearance. Seats are adjustable and the interiors are roomy. Silence has been achieved by careful insulation of all body and door panels. In addition felt padding under the floor carpets assists in deadening sound as well as insulating the interiors against heat and cold.

Mohair or broadcloth upholstery is offered. All instruments, including engine heat indicator, ammeter, fuel and oil pressure gages, are symmetrically

grouped and indirectly lighted. Below the instruments are the buttons for controlling the instrument light, throttle, ignition switch, carburetor choke and spark advance. Headlight control, together with the horn button, is placed at the center of the three-spoke steering wheel.

Low chassis height is secured by means of a double drop frame, the main channel size being 6 x 3 x 5/32 in.

Interior adjustable visors are provided as standard equipment. Also contributing to the comfort of the driver are the adjustable steering column and the adjustable seats. Ventilation for the driving compartment is provided by means of a ventilator in the top of the cowl.

1932 Willys-Overland Commercial Line Comprises Three Groups

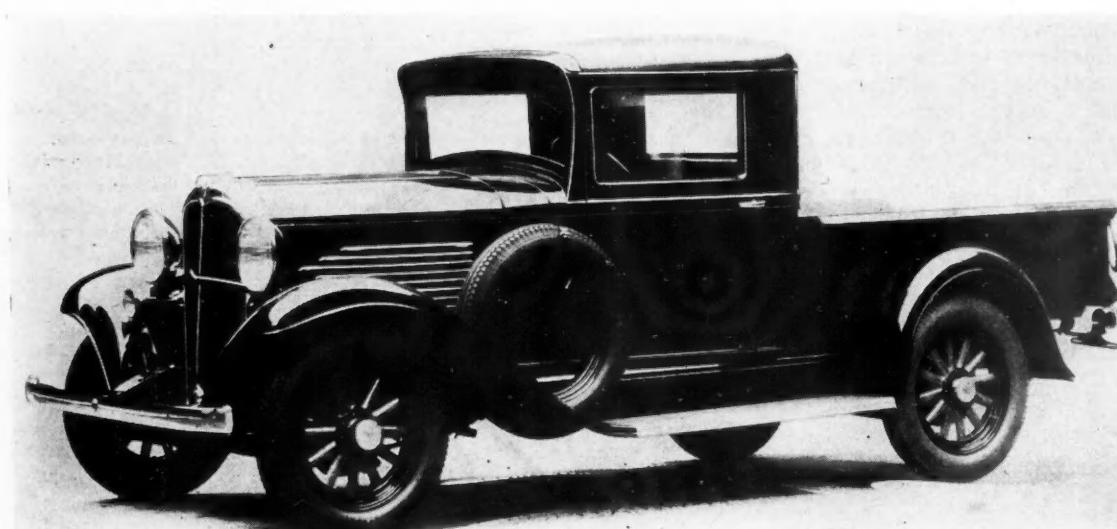
A NEW 1932 line of trucks and commercial vehicles, with a wide range of body types, is being announced by Willys-Overland. The line comprises three groups: the Model C-113, a 1/2-tonner with a wheelbase of 113 in.; the model C-131, of 1½ tons capacity, and the Model C-157, also of 1½ tons capacity and with 157 in. wheelbase. Prices of the Model C-113 group range from \$415 to \$850; those of the C-131 group range from \$595 for a chassis with 131 in. wheelbase and single tires, while the prices of the C-157 group range up to \$675 for a chassis with 157 in. wheelbase with dual tires.

This new line of commercial vehicles is powered by the Silver Streak engine rated at 65 hp. The 113-in. chassis is available from the factory in four distinct styles, including a de luxe cab pick-up, a de luxe sedan panel, a de luxe canopy express, and a de luxe station wagon. The chassis is fitted with long semi-elliptic springs of chrome-vanadium steel, self-adjusting Tryon shackles, and double-acting hydraulic shock

eliminators, at both front and rear. The four-wheel brakes are Bendix duo-servo, of the internal enclosed type, with cable hook-up.

The 1½-ton chassis have a girder-type frame construction. These two chassis also are offered with a wide selection of bodies to meet all commercial and agricultural needs. In both, the rear axle is of the full-floating type, the axle shafts being of chrome-nickel steel and the axle housings of the all-steel, banjo type with large inspection cover.

The 131 and 157-in. chassis are fitted with four-speed transmissions with provision for installing a power take-off. The clutches are of the dry-disk type and have a ball throw-out bearing with provision for lubrication. On the C-157 the propeller shaft is in two sections, with three universal joints, and is supported by an intermediate bearing mounted on a frame cross member. Wheels on these models are of the cast type, with demountable rims, and a wide selection of tire and rim sizes is offered.



Willys-Overland Model C-113 with cab pick-up body

Smaller Tips Used for Welding Monel Metal

In welding monel metal the welder should use a blow-pipe tip one or two sizes larger than that ordinarily used for sheet steel of the same thickness. It is essential to use a flame that shows a barely perceptible excess of acetylene.

Strips cut from the sheet can be used as welding rod, if cold drawn monel metal wire is not available. Ordinarily a little brazo flux will be found helpful to the welding operation.

As the welding starts, a skin of oxide and slag forms on the surface of the molten metal. This is of advantage in protecting the metal underneath from further oxidation. For this reason the welding rod should always be applied and melted under this oxide skin, and any dirt or other foreign material should be worked up into the slag.

The weld should be built up well above the surface, so that the subsequent removal of the slag and impurities by grinding the surface will leave good, sound metal in the weld.

For handling thin sheet metal up to about 1/16 in. thick, the edges should be flanged about 1/32 in. and tack-welded every few inches along the entire seam.

A jig can be used to advantage, but in the event that one is not employed, a flat bar can be placed on each side of the seam. This aids in absorbing any excess heat and thus prevents warpage. The flanges are then fused flush with the sheet. Once started, the weld should be completed as rapidly as possible and without interruption. A little brazo flux will be of help in maintaining sufficient speed on the very thin sheet.

Sheet over 1/16 in. should always be beveled prior to welding. By separating the beveled edges about 1/32 in. where the weld is started, and $\frac{3}{8}$ in. for every foot along the seam, contraction of the welded seam is taken care of. Occasionally wedges or clamps may be used to restrain this movement to some extent.

As emphasized previously, the welding operation must be done rapidly and without stopping right to the end of the seam, and it must be done right the first time. Never attempt to reweld or smooth up a weld in monel metal. Any slight distortion or warping in the welded sheet can be removed by hammering or rolling, because the weld remains soft and ductile.—From *Oxy-Acetylene Tips*, March, 1932.

Myths Hinder Diesel Growth

(Continued from page 580)

is from 2-ton capacity and up. A good estimate of the immediate market might be made (if the information were readily available), by taking the totals of heavy-duty units in the truck and bus field and a reasonable percentage of aircraft, marine and industrial production.

Quite consciously emphasis has been laid on the desirability of concentrating on heavy-duty units, i.e., those that burn large quantities of fuel. The reason for this is that fuel cost is only a small part of the total operating costs of a transportation unit considering the fixed as well as variable expense. The figure generally accepted in the truck operating field is 10 per cent for fuel. If the Diesel saves 50 per cent of the fuel cost, the net result is only 5 per cent of the total. However, this 5 per cent may be an impressive figure in dollars and cents in the yearly operation of a truck, bus, or commercial aircraft.

Returning to the fuel situation, if we assume a nominal yearly addition of Diesel units, say, of the order of 50,000 a year, fuel prices probably would remain unchanged. But we should expect a fuel tax.

With appreciable growth due to the effect of annual increments in various fields, there would be an approach to a condition of stability in the prices of fuel oil and gasoline. If furnace oil is used, the price per gallon might be, say, 2 cents less than gasoline in bulk. At the present time, the difference is about 3 to 4 cents at the outside. This, too, should carry the item of tax, although industrial units might be favored and remain tax-free; and it is conceivable that industrial sta-

tionary units may have the additional benefit of tax-free fuel for a long time.

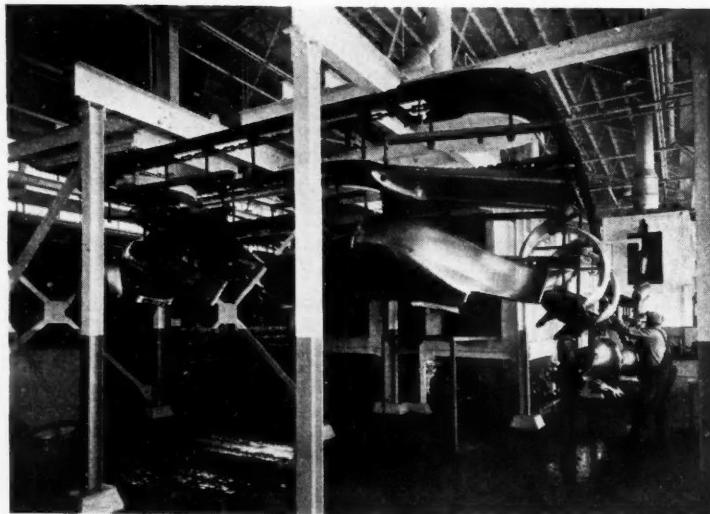
But the price is governed by the trend in fuel oil specifications. If a highly refined product is demanded and there is reason to feel that it will be, the price of the special fuel may be equal to that of gasoline, particularly if there is a balance in the volume of production of the two fuels.

No one believes, however, that any of these economic changes will disturb, much less disrupt, the fuel market. Certainly there is no ground for the belief that eventually the price of any new fuel might go kiting. It's purely a business proposition with the refiner. If gasoline were to go out of use or become a by-product, the fuel oil would carry the load in about the same fashion as gasoline is doing today. But that event still is far in the offing.

The foregoing has been an effort to bring out some of the fundamental and perhaps misunderstood facts concerning Diesel fuel outlook. We have mentioned the theoretical economy of the Diesel and the possibility of cutting operating costs on heavy-duty units. We have also pictured trends in price with particular emphasis on taxation and the possible equalization in the price of gasoline and fuel oil.

Fuel economy is only one aspect of the economic significance of the high-speed automotive Diesel; a point-by-point comparison of design and performance characteristics of the gasoline and Diesel engine will be made in the next instalment of this series.

Long Beach Plant Bonderizes Ford Steel Parts in Quantity



Conveyor moving parts out of washer and into bonderizer. Note the ascent to enter tower from which it descends to carry parts through bonderizing solution

THE assembly plant of the Ford Motor Co., recently erected in Long Beach, California, stands as a model for efficiency in equipment and layout in both the assembly and finishing divisions. It has a pressed steel division, with presses running up to 105 tons, where are stamped out such parts as fenders, fender wells, running boards, dust shields, hoods, etc., to be distributed to all of the assembly plants on the Pacific coast.

The main building is 387 x 920 ft., fronts on Long Beach harbor and is served by two parallel spurs from a railroad, both of which run along the north side of the building, one outside and one inside. Overhead conveyors distribute stock and parts all over the plant from here. Equipment for finishing, ovens, etc., take up more than half the space in this plant and gas is the fuel used throughout. Fenders, etc., which

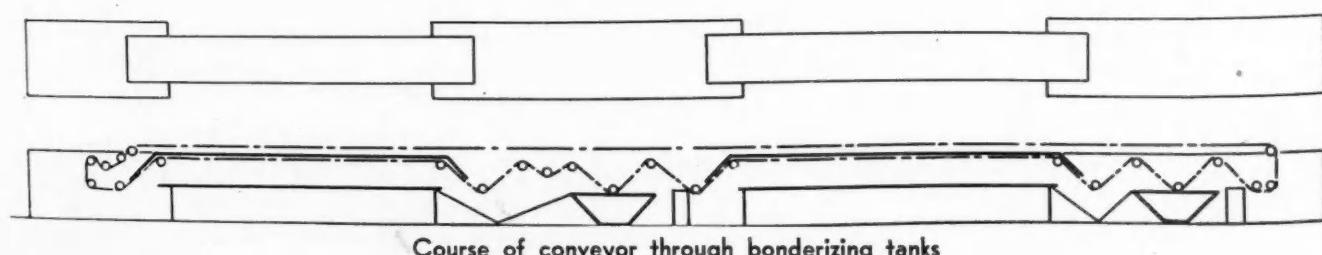
*American Gas Association.

are to be enameled are first put through the bonderizing process which prepares and rustproofs the steel.

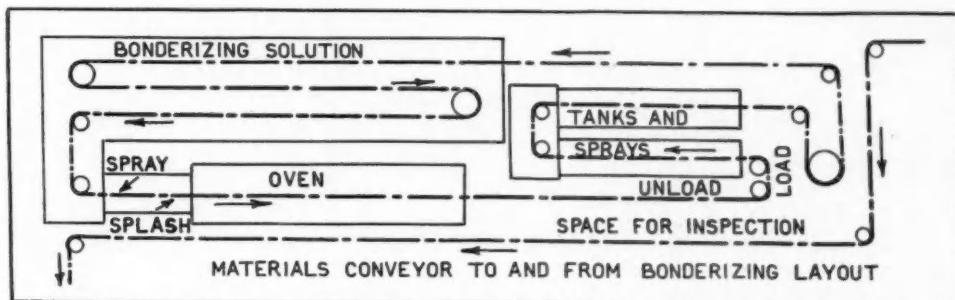
Bonderizing consists of putting the steel parts through a solution of manganese phosphate and iron phosphate in water, at a temperature of 210 deg. Fahr. The layout for this process is somewhat complicated, for the steel parts must be carefully cleaned before bonderizing and then thoroughly dried in a gas-fired oven.

The first unit consists of a sheet-steel chamber 16 ft. wide and 40 ft. long containing tanks with pressure sprays above them. The first two contain soda solutions and the other fresh water. All are heated with live steam from gas-fired boilers and the solutions and water are pumped through the sprays onto the parts as the conveyor carries them along, the excess draining back into the tanks for reuse. The conveyor then enters the bonderizing compartment and makes three passes through it, the time in solution being 10 minutes, after which they go through a rinse tank of hot water and then through a drying oven which removes all traces of water. The temperature of this oven is 450-500 deg. Fahr.

The remainder of this setup includes a washer (tank and spray) and an oven 10 ft. wide and 45 ft. long. The oven is the full muffle type and is constructed of sheet steel, heavy insulation and fire brick. The muffle is 8 ft. high and 5 ft. wide and occupies the upper portion of the oven. Below is the combustion chamber into which fire four gas burners from each side, the heat rising up around the muffle. A temperature of 450-500 deg. Fahr. is maintained and a chart kept by a recording pyrometer. There is 60 ft. of conveyor exposed from the exit end of this oven to the



Floor plan (conventionalized) of entire bonderizing department



entrance end of the washing unit, for loading and unloading the parts. As the parts emerge from the oven they are transferred to a parallel conveyor which takes them to the enameling ovens.

The enameling setup is 380 ft. in length and includes two ovens and two dip tanks, all in one straight line, with a chain conveyor taking the parts through a two coat process, continuously and automatically. Operators load them at one end and remove them at the other with the two coats dipped and baked on. There are three glassed-in inclosures, one at the loading end of the first oven and covering the first dip tank and loading operators, one between the two ovens and inclosing the second dip tank and the third at the unloading end of the second oven and covering the unloading operation. In this way the entire system is sealed off that no dirt-laden air from outside can penetrate. All fresh air used in this system is forced in through filters.

The ovens are of a modified A-type heated with separate gas-fired heaters which set under each oven, the hot air being forced into the ovens by fans and through ducts. There are four heaters for each oven and two gas burners for each heater. The oven ducts, one on each side, start at a point 40 ft. from the loading end and extend for 70 ft. inside the oven. They are of sheet steel placed on the bottom and against the walls with openings at intervals for the heat to pass into the oven. These openings have hinged covers so that the flow of heat can be so regulated as to be distributed evenly throughout the oven.

The heaters are of the indirect fired type in which the products of combustion travel in a circuitous path inside tubes, while the air to be heated is passed over the exterior of the tubes, the heat being transferred through a large area of fin radiating surface. The shell is built of sheet steel and is insulated to minimize radiation losses. The fresh air is drawn through a filter to rid it of dirt and dust that might otherwise settle on the parts being enameled. The temperature in each oven is maintained continuously with an automatic temperature control, equipped with recording pyrometers.

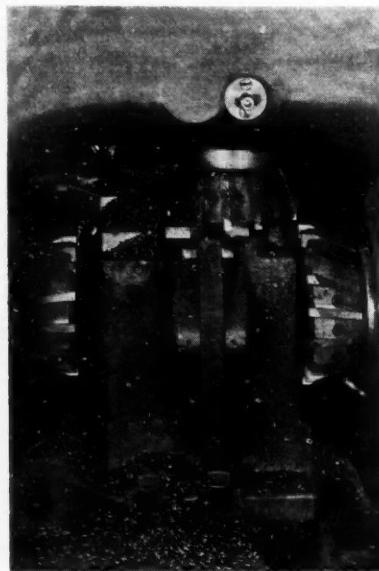
Loading and unloading section of the bonderizing conveyor. Note the parts emerging from the oven at the left and entering washer in center

While this oven sets on supports about 5 ft. above the floor and resembles closely the A type oven, the legs on each end are hardly more than hoods. From each one of these hoods rises a venturi-type stack, a motorized fan forcing air into it, about half way up, through a short length of pipe serving as injector. Both coats are baked on at a preheat of 250 deg. and high heat of 440 deg. Fahr., forty-five minutes for each coat.

Alongside this oven is a burnoff oven through which the work is first run to burn off any grease and dirt and in conjunction with this is a washer with tank and sprays. A system of pumps and pipe lines supplies paint, enamel, etc., from the storage tanks to all parts of the finishing division and this system is directly connected with the enamel tanks of the ovens just described. In case of fire these tanks are automatically drained in less than eight minutes. All of the units in the finishing division are served with an automatic fire protection system of the chemical-spray type.

The final assembly line is 560 ft. in length and runs at a speed of 140 in. per min. It requires only 48 min. to assemble a car complete from the time the chassis is put on the head of the line to the time its tank is filled with gasoline and it is run off under its own power. While the capacity of this plant is being increased it will turn out, at the present time, 400 completed cars and trucks every 8 hr. All of the conveyor lines in this plant feed either directly, or through other lines, onto this final assembly line.





PRODUCTION LINES

To Publish Journal

The Institution of Automobile Engineers in Great Britain will shortly begin publication of its own journal, according to a recent statement by the secretary.

Need Balance?

Grits and Grinds for March, 1932, has an interesting discussion on the dynamic balancing of rotating parts. It suggests the possibility of cutting costs by substituting a simple balancing operation for a more expensive machining job. For a rapid production method of balancing it offers the Norton Running Balance Indicating machine which has been considerably improved. A booklet on the subject may be obtained without charge. Ask for the Norton "Treatise on Dynamic Balance."

Optical Measurements

A reference manual on optical pyrometry has just been issued by the Bacharach Co. In addition to the general aspects of the subject it describes the Bacharach optical pyrometer (Holburn - Kurlbaum type). If interested ask for Bulletin 296.

Remarkable Age

Understand that a certain low-priced car is being dressed in a coat of paint with synthetic resin as a

base. The brief drying period required fits well with a zooming assembly line. If you would like to know more about synthetic resins —what they are and why they are used, see *Automotive Industries*, Dec. 19, 1931. Incidentally, those using synthetic resin finishes should tell the service field something about it.

Seeing is Checking

Employees in the Chrysler plant whose work requires mechanical exactness, have their eyes examined regularly by a licensed staff optician. If glasses are needed, they are fitted. The most perfect gages made are of no value if faulty eyesight leads to incorrect readings.

25 in a Row

Metal Statistics for 1932 has just been published by the American Metal Market, thus making it 25 in a row of this handbook of statistical information concerning ferrous and non-ferrous metals. A number of new tables have been added and in the case of major non-ferrous metals, the tables have been expanded to include price ranges for the past fifty years. *Metal Statistics* sells for \$2.

Exit Depression

Al Reeves, gm. of the N.A.C.C., says we are in the Reconstruction Period and Al knows what he is talking about. We've scraped bottom and are on the up and up. The next one that says anything about "depression" will be crowned.

April 16, 1932

Michelin Issues Guide

The Michelin tire firm of France has recently issued a motor-freight guide (*Indicateur des Transports Automobiles de Merchandises*) which is intended to be to the shipper by motor lines what the Railway Guide is to the railroad shipper. A feature of the Guide is a list of gas-oil stations throughout France, evidently in view of the introduction of Diesel engines in motor trucking service.

Electrolytic Galvanizing

Mining and Metallurgy for April, 1932, says that shortly one of the big steel companies will be producing "galvanized" wire by the Tainton process. By means of electrolysis steel wire is to be coated with high-grade zinc, thereby making a product possessing many important advantages. It is claimed that the coated wire can be bent or twisted without fracture or peeling of the zinc.

Radiator Finish

Ford is showing a complete line with radiators finished in lacquer. Chalk up another car maker to the ones experimenting with an all-lacquer ensemble. Whether this simplifies the problem of radiator finish only time will tell.

Measuring Resistance

A brief treatment of electrical resistance measurements and latest apparatus for the purpose is found in a new booklet just off the press. Ask for Catalog 40 published by Leeds & Northrup.—J.G.



Automotive Industries

Stainless Steel Polishing Requires Freedom From Particles and Spots

THE wider use of the new non-corrosive metal alloys, known as stainless steels and stainless irons, because of their ornamental as well as utilitarian characteristics, has led to extensive and somewhat confusing discussion of the polishing of these metals. The following article contains the recommendations of Norton grain demonstrators as based upon actual experience in factories throughout the industry.

Stainless steel polishing is not as complex as at first thought. There are two main factors which decidedly influence the retention of the luster on any finished piece of stainless steel or iron, whether it be made from sheet stock or casting. These two factors are freedom of the finished surface from minute foreign particles, particularly finely divided iron, and the complete removal of all slag spots, scratches, pit holes or even tiny imperfections.

The possibility of impurities or foreign particles being left on the surface may be minimized by the use in all polishing and buffing operations of manufactured aluminous abrasive such as Alundum abrasive, that is, substantially free from iron. Proper selection and sequence of grain sizes, the crossing of scratches in each succeeding polishing operation and the addition of operations where crossing of scratches is impossible will minimize the probability of scratches or other imperfections being left on the finished surface.

With these two factors in mind little difficulty should be encountered in the polishing of the stainless steels and irons. Other difficulties encountered when these metals were first produced have been overcome by improvement in the product itself and by knowledge gained in its polishing.

Generally speaking, the principal difference in the grinding or polishing action on stainless steel or iron in comparison with other steel alloys is that stainless metals are a little tougher, a little more stringy. They show a tendency to drag, and because of this action wheel life is shorter than it is on some of the other steel alloys.

Other than compensating for the above-mentioned difference, the polishing of stainless steel is done much as is the polishing of any alloy, although operators must be more careful with stainless steel than with carbon steel. Care must be exercised to prevent excessive heating; wheel speeds must be controlled, pressure must be controlled; the proper amount and type of lubricants used; care employed in the selection of buffs and the proper selection of abrasive grain sizes.

Wheel speeds in polishing should range between 6500 and 7500 s.f.p.m. In buffing, the speed should be between 10,000 and 12,000 s.f.p.m., and in every operation it is very important that the wheel be in balance. Tallow or some other lubricant should be used to prevent overheating and discoloration on all operations except the first and the final coloring. In cutting-down opera-

tions the operator should avoid forcing the wheel, as this often causes discoloration which is difficult to remove in later operations.

In the roughing operations as fine a grain size as possible should be used in order to prevent deep scratches which later may require extra operations to remove. Finer sizes may be used for the first operations on sheet stock than on castings because of the differences in the condition of the metal when it comes from the mill and foundry.

Having selected the proper size and sequence of grain the crossing of scratches will materially aid in attaining the desired finish. When succeeding scratches follow in the same direction, there is a tendency for the abrasive to cut deeper, necessitating further operations and waste of material to remove these cuts. Crossing of the marks also enables the operator to determine definitely whether or not the scratches of the previous operation have been removed. In some cases where automatic machinery prevents the crossing of scratches extra operations will be necessary to obtain an equivalent finish.

Method of Coating Belts and Rolls

Two methods are used in coating belts and rolls. Where fine grain sizes are used the general practice is to thin the glue to the proper consistency for the size of the abrasive to be used, then add the abrasive until the mixture is of the right consistency for spreading. It is very important to stir the mixture thoroughly before application. The abrasive, being so much denser than the glue solution, settles to the bottom very rapidly and unless held in suspension by stirring, it will be almost impossible to get a uniform structure on the coated belt. Two coats of abrasive are generally used on the belts. In coating the rolls as many coats are required as are needed to build up a head approximately $\frac{1}{4}$ in. thick.

When coarse grain is used the paste process is impractical because of the difficulty in spreading the mixture of glue solution and grain. Limitation of grain size which can be used in paste form is dependent upon the experience and skill of the set-up man and the requirements in each instance. In some cases, a paddle rather than a brush is used for spreading, but even this procedure may result in an extremely hard coating which tends to burn the metal.

The more practical method of coating belts with coarse size grain is to apply the glue solution to small portions of the belt or roll at a time and spread the abrasive on to the glue by sifting. The grains are readily bonded by the glue and a more uniform head results.

After being coated and allowed five or six days to dry out, these rolls will be out of truth. This error is corrected by turning them in an engine lathe using a Crystolon abrasive brick in the tool post. The use

*Published in Grits and Grinds, Feb., 1932. Norton Co. Staff Research Project.

of oil on the brick will prevent it from glazing the surface of the roll. A slow speed should be used at first when turning a roll into truth, but it should be finally trued at running speed.

Polishing of Fabricated Sheet Stock

The size of the grain used on sheet stock after it comes from the mills depends upon the condition of the sheet and the absence or presence of die marks and the depth of these marks. The best practice is to use a No. 120 or No. 140 (G.M.S.) grain size to remove the die marks, and follow with No. 170 (G.M.S.) or No. 200 (G.M.S.) to remove these scratches. No. 170 (G.M.S.) or No. 200 (G.M.S.) is usually coarse enough to remove any marks which may be found in the stock, and prepare it for the following operation which should be No. 280 or 1F. The No. 280 or 1F should be followed by a tampico brush for certain finishes, using a fine abrasive paste as the cutting agent. The surface speed of the tampico brush should be approximately 7000 s.f.p.m. It is possible to omit the tampico brush on very small parts, and use a quilted sheep-skin wheel instead of a rag wheel on the operation when No. 280 or 1F is used. The part is then ready for the buffering wheel.

Polishing of Stainless Metal Castings

Differences in the structure of stainless metal castings and sheet stock necessitate a somewhat different procedure in the polishing.

Castings have an outside shell which is very difficult to penetrate and it is necessary to use a much coarser grain for the roughing operation than on sheet stock. It is often necessary to use a No. 36 grain to cut through this shell and remove it. On forging No. 60 grit is generally coarse enough to cut through the shell.

A No. 100 or No. 120 grain will remove the scratches made on the castings during the roughing operation. The following operations are the same as in the polishing of sheet stock. No. 120 grit is followed by No. 180 or No. 220, and that by 1F or 2F. On certain types of castings it is not necessary to use as fine abrasives for the final polishing operation before buffering as this material cuts more easily than does the sheet stock and the buffering wheel will remove the scratches made by the polishing wheel.

The first and second set-up wheels should be used dry, but an abundance of grease or tallow should be used on the other operations. Several types of wheels are employed. On table cutlery the compressed wheel is generally selected. A sewed buff or rag wheel is also used on the first two operations and a quilted sheep-skin or felt wheel depending on the shape of the piece being polished will give the best results on the last operations.

Buffing

Buffing is the final step in producing a high mirror finish on stainless steel. The buff should be run at a surface speed of 10,000 to 12,000 r.p.m. The quality of the buff should be a high count sheeting such as 88/88 or 84/92, spiral sew of $\frac{1}{4}$ or $\frac{3}{8}$ in. A buff of low count should not be used, as a buff cannot cut too much on stainless steel.

The cost of buffering stainless steel is still out of proportion to polishing as compared to other metals, but there has been a decided reduction compared to the

first efforts in polishing and buffering this metal. This reduction has resulted from improvements in buffering compounds, but principally from more time and effort spent in polishing the metal in preparation for buffering.

The amount of grease used in buffering compound varies according to the finish required and the condition of the piece as it reaches the buff wheel. Where it is necessary to cut out fine scratches, enough bond should be used to hold the compound on the wheel so that the operator will not try to force the cutting action and "burn" the metal. It must be remembered, however, that too much grease will tend to leave a cloudy finish, and where a high luster is desired, less grease should be used.

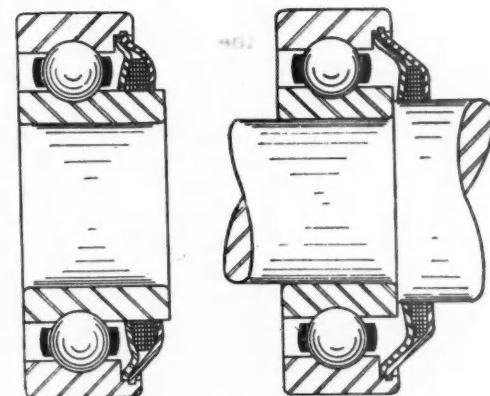
Several fine buffering compounds are now made by the suppliers, though in all cases where materials are being selected it is good practice to be certain that they are substantially free from iron or other corrosive materials which might be deposited on the surface during buffering, and later tarnish or discolor.

As in the polishing of every other metal, there is no single set of grain sizes or materials which can be specified for each step in the polishing and buffering of this material. Varying conditions in each instance call for slightly different recommendations.

Standard Oil Retainer for Ball Bearings

AN improved oil retainer for ball bearings is being marketed by Standard Steel and Bearings, Inc., of Plainville, Conn. A patent on this construction was granted recently to George O. Hodge who assigned it to the concern mentioned.

The oil retainer (or seal) is composed of two circular plates wedged together into a groove in the outer ring of the bearing. Between these two plates is a wiper or ring of felt that makes contact with the inner ring of the bearing, or with a shaft. The felt ring forms an oil-stop or dam that retains the lubricant within the bearing.

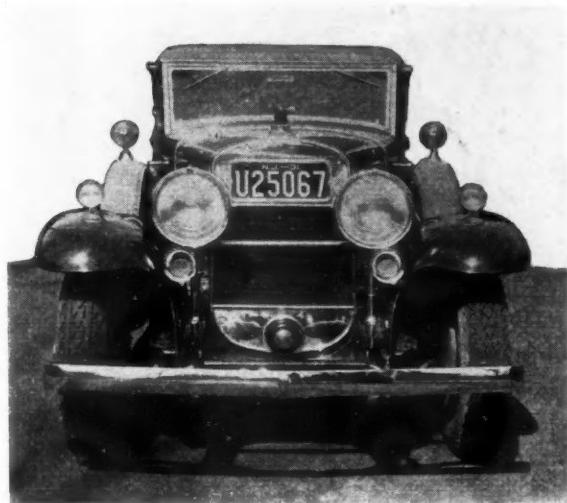


Standard oil retainer for ball bearings

Plate construction and assembly are said to be such that there is a constant pressure against the felt ring between the plate-members; this pressure tends to constantly press the felt ring against the rotating inner ring or shaft so as to improve the sealing contact and to take up wiper wear as it develops.

Smaller Water-Pump, Steady Engine Temperature With "Steam" Cooling

(Continued from page 587)



Front view of Cadillac 12 fitted with Rushmore cooling system (number plate covers part of the large top tank)

with the conventional system. In practice, however, both water and steam pass from the jacket to the radiator, and the delivery of the pump therefore is somewhat greater than indicated by the ratio mentioned.

As an example of the pump capacity actually required, it may be mentioned that on a Cadillac 12 which has been fitted with this cooling system, the pump comprises two 20-tooth gears of 1 $\frac{3}{8}$ -in. outside diameter and 1-in. width of face. The capacity of this pump is such that under normal conditions the water enters the jacket at about the same temperature as in an ordinary water-cooled engine. The water leaving the jacket is automatically maintained at boiling temperature, because as soon as it drops below that temperature the level in the top tank falls below the outlet from the radiator and no more water is supplied to the jacket, which quickly restores the boiling temperature in the jacket. In the Cadillac the water enters the jackets at the rear of the blocks, but that is merely because this was found to be the only convenient place to make connections. In an engine specially designed for this cooling system the water would enter the jacket close to the outlet, so that the temperature would be more nearly uniform throughout the jacket.

It seems from Mr. Rushmore's experiments with this system that when the engine is fully loaded, practically one-half of the water originally in the jacket is forced out. If the engine is suddenly stopped after a hard drive up a long hill, for instance, one-half of the water from the jacket, all of the water from the radiator core and a considerable portion from the bottom tank are forced into the top tank, and the latter must be large enough to accommodate all of this water. For-

tunately, the core need be only from 50 to 60 per cent as large as that carried on equivalent water-cooled cars, and the bottom tank also can be small, so that the total amount of water carried is no more than with the usual water-cooling system.

A pressure valve set to about 3 lb. p. sq. in. is fitted on the line close to the outlet from the jacket. This is advantageous if it is desired to use steam from the cooling system for heating the interior of the car in winter time, for with some pressure on the line the car-heating radiators may be made very small and may be connected in series, the steam pressure being depended on to scavenge out all air and condensate. Light pressure in the system has the incidental advantage that it keeps down the size of the steam bubbles and therefore the amount of water forced from the jacket.

Among the advantages of steam cooling may be mentioned the following:

Without the use of a thermostat, the cylinders are brought up to their normal working temperature very rapidly, since no circulation can take place until the water in the jacket begins to boil.

Thereafter the cylinders are maintained at a substantially constant, high temperature, which raises the fuel economy and reduces crankcase dilution.

Owing to the fact that the radiator core constantly contains steam and water at the boiling temperature, which makes the mean temperature difference between the core and the atmosphere nearly twice that with the usual cooling system, a smaller radiator can be used.

Both the radiator core and the pump being smaller than with the conventional cooling system, there is an appreciable saving in weight (about 38 lb. in the Cadillac 12, according to Mr. Rushmore).

With this system of cooling, a steam-heating system for the interior of the car can be installed at low cost and gives very satisfactory results, since it eliminates all trouble from exhaust gases inside the car due to leaky joints.

If the system comprises a pressure valve and is closed to the atmosphere, there is practically no loss of alcohol if an alcohol solution is used as an anti-freeze in winter time.

Leather Belting is Now Sold by Thickness

THE American Leather Belting Association has decided that for the greater protection of the consumers of leather belting it should establish and sell this commodity by specifications of thickness instead of weight, thereby discarding the old weight terminology of "ounces per square foot."

The thickness specifications now in effect are:

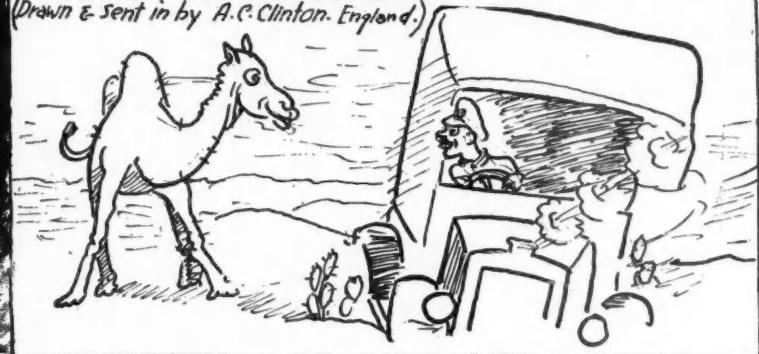
| | In. | In. |
|---------------------|-------|----------|
| Medium single | 10/64 | to 12/64 |
| Heavy single | 12/64 | to 14/64 |
| Light double | 15/64 | to 17/64 |
| Medium double | 18/64 | to 20/64 |
| Heavy double | 21/64 | to 23/64 |

Automotive Oddities—By Pete Keenan



DURING THE REIGN OF QUEEN ANNE IN ENGLAND FASHIONABLE HANDKERCHIEFS HAD ROAD MAPS PRINTED ON THEM. (circa 1710 A.D.)

IN CONNECTION WITH THE INVESTIGATION OF THE BEARING AREAS OF MOTOR TIRES. THE BEARING AREA OF A CAMEL'S FOOT WAS DETERMINED.
(Drawn & sent in by A.C. Clinton, England.)



Write us if you know an "Oddity"

The NEWS TRAILER

Exploitation of the new comprehensive risk policy for motorists and also of the new towing and service expense indorsement, has been recommended by J. Wiley Burden, automobile superintendent in the western department of the Hartford Fire Insurance Co., before the Illinois Pond of the Blue Goose, insurance organization.

The first of these coverages, which provides indemnity for virtually every form of physical damage to an automobile, will simplify automobile underwriting and eliminate the possibility of complaints and misunderstandings on the part of the assured, he said.

The towing and service expense indorsement is a useful weapon in the competition with automobile and motor clubs, he pointed out, because it gives service at a cost of only \$2 a year per car.

General Motors Truck Co. and the Greyhound Corporation will sign a contract within a few days for furnishing the transportation at the Chicago World's Fair in 1933. Plans have been agreed upon which include operating two sets of vehicles, one moving at

swift speed and one going slower, to permit sightseeing. The express vehicles will have a separate highway over the huge grounds set aside for the fair. The fleet will be built up to 60 units and will consist of specially designed truck and semi-trailer type vehicles with novel lines and coloring. They will have longitudinal seating arrangement with capacity for 90. Turnstiles will be used to collect fares on the high speed group.

Plymouth has made excellent use of aluminum ink in a new consumer booklet, just out. It shows the specific parts described in metallic ink, one of the newer wrinkles in printing. This novel scheme gives the non-technical owner some idea of the importance of mechanical detail—a point generally lost entirely to the layman.

The Hupp entry at Indianapolis has been officially registered, and according to Steve Hannagan, four other automobile factories are considering entries in their own names.

NEWS

Rails Cut Rate For Spring Hauls

Action Anticipates Competition from Highway Carriers

WASHINGTON, April 14—Reduced rates on "freight" and passenger automobiles have been or are being established by railroads on short notice in order to meet truck delivery in connection with spring distribution to dealers.

The Interstate Commerce Commission has granted the application of the Chicago, Milwaukee & St. Paul to put into effect upon one day's notice reduced rates from St. Paul, Minneapolis, Minnesota Transfer, Fordson, Duluth, Minn., and Superior, Wis., to points in Minnesota, North Dakota and Wisconsin. The Canadian National has made similar application to establish rates from Duluth and St. Paul of \$1 and \$1.10 per 100-lb., respectively, to Baudette, Pitt, Grace-ton, Williams, Roosevelt, Warroad and Longworth, Minn. These rates have already been established by the Great Northern.

The C. M. & St. P. reductions are based on a distance scale starting at 100 miles and under and ranging up to 626 miles. In cents per 100-lb., they begin at 30 cents, and advance 2½ per 100-lb., for each block of 10 miles up to 150 miles. From that point they advance 4 cents for each block up to 290 miles, and then advance 10 cents for each block through the remainder of the scale, till the maximum of \$1.40 is reached.

Briggs Gets Contracts

DETROIT, April 14—Briggs Mfg. Co. today announced receipt of orders for sport type open and closed bodies for Hudson and Essex models and a convertible body for the new Rockne Six.

When fabrication of these new units gets under way in the very near future, activity in Briggs plants, which is now at the highest point

since early summer last year due to the production of new Ford, Plymouth, DeSoto and Chrysler Six bodies, will be materially heightened, according to Mr. H. E. Hund, vice-president and general manager of the company.

Tax Presentation Program Set

NEW YORK, April 14—Directors of the National Automobile Chamber of Commerce will appear before the Senate Finance Committee Monday, April 18, to present the industry's plea against excise and other discriminatory taxes. George Graham, president of Willys-Overland, will act as spokesman, as he did before the House Ways and Means Committee.

Alfred P. Sloan, Jr., Edsel B. Ford, E. L. Cord, Roy D. Chapin, Robert C. Graham, Charles D. Hastings, and Robert Page, directors, will reinforce the manufacturers' case.

Alfred Reeves and Pyke Johnson, vice-presidents, respectively, have been working with the committee on the anti-tax program of the chamber.

Ford Schedules Increasing

DETROIT, April 14—The present payroll of the Ford Motor Co. includes approximately 80,000 workers, and daily postcards are being sent out to notify former employees to return to work. Production is expected to reach 1000 units daily before the end of April.

4,888,800 Saw G. M. Spring Show

DETROIT, April 14—Total attendance at General Motors' spring showings in 55 cities throughout the U. S. in the week beginning April 2 reached 4,888,800, according to an announcement from the corporation.

Morse Goes to Far East

E. C. Morse, president of Chrysler Export Corporation sails from San Francisco April 22 on S.S. President Grant for an extended business trip through the Far East.

Michigan Sales Point to Gain In Rural Sections

DETROIT, April 13—Michigan new car registrations for March indicate a more definite rate of improvement in new car buying in rural districts than in industrial areas. While total sales are 60 per cent behind last March, and 29 per cent behind, excluding Ford and Chevrolet, total sales are two per cent ahead of February and excluding Ford and Chevrolet, 18 per cent ahead. Contrasted with this the Detroit industrial area registered a gain of 14 per cent over February, excluding Ford and Chevrolet, and with both included showed a decrease of four per cent.

Such figures, moreover, as are available would indicate that future increases are to be looked for in the smaller towns and communities rather than in the larger centers. Michigan registrations for March totaled 4318, as compared with 4230 in February and 10,758 in March last year. The best showing, as compared with last year was made by the high-priced group including Cadillac, Lincoln, Packard and Pierce-Arrow. Plymouth, DeSoto, Hupmobile and Graham also showed larger sales. The majority of manufacturers showed increased sales in March over February of this year. Largest decreases, of course, were registered by Ford and Chevrolet with Hudson, Essex also showing a fairly heavy decline.

Commercial car registrations showed a more definite improvement with a total of 570 for March, as against 451 in February. Excluding Ford, commercial car sales increased almost 40 per cent over February, almost equal to March, 1931, sales including Ford. Sales in rural districts, however, are lagging behind those in industrial centers.

Packard Ships 2145

DETROIT, April 11—Shipments of the Packard Motor Car Co. during March totaled 2145 cars, about the same number shipped in February. The report also states that production is substantially ahead of the corresponding period last year and also of January this year.

G. M. Names Fisher

Alfred J. Fisher has been named to the operating committee of the General Motors Corp.

Monthly Estimates of Motor-Vehicle Stocks Abroad at End of February, 1932

WASHINGTON, April 11—The following information based upon data obtained from the most reliable sources, is supplied by the foreign offices of the Bureau of Foreign and Domestic Commerce. Every care is used in the preparation of the estimates

which are made only after careful investigation. "High" means that the supply is considered large in relation to current state of demand. "Normal" is used almost synonymously with "adequate," that is, when the volume

on hand is sufficient to supply immediate requirements plus the estimated demand for 1 to 1½ months. "Low" means that the volume on hand is not considered sufficient to supply immediate requirements.

| Country | PASSENGER CARS | | | TRUCKS AND BUSES | | | | | | |
|----------------------|---------------------|-----------------|------------------------|----------------------|-----------------------|---------------|-------------------------|-------------------|-------------------------|-------------------|
| | Low Priced U. S. | Priced Other | Medium Priced U. S. | High Priced U. S. | Cars Used U. S. | Cars Other | Heavy Capacity U. S. | Capacity Other | Light Capacity U. S. | Capacity Other |
| Argentina | N | N | H | N | L | L | H | N | H | N |
| Chile | H | H | H | H | L | L | L | — | H | L |
| Colombia | U-L | — | L | N | — | — | N | — | L | — |
| Cuba | L | N | N | N | N | N | N | — | N | — |
| Mexico | L | NONE | L | NONE | N | N | N | — | N | — |
| Panama | S-H | — | S-H | — | N | N | — | — | N | — |
| Peru | L | N | L | L | N | N | N | — | N | — |
| Porto Rico | N | NONE | N | NONE | N | N | N | — | N | — |
| Uruguay | L | L | U-L | L | NONE | NONE | U-L | U-L | H | U-L |
| Brazil | N | N | N | S-H | N | — | N | N | N | — |
| British Malaya | N | N | L | L | — | — | H | N | L | — |
| Japan | S-H | U-H | (2)N | N | — | — | U-H | — | S-H | — |
| N. E. Indies | H | H | N | N | — | — | H | — | L | — |
| Philippines | N | — | N | N | — | — | N | — | LL | — |
| Siam | H | H | N | H | NONE | NONE | L | — | LL | — |
| Gold Coast | N | N | N | N | NONE | NONE | N | — | HL | — |
| Australia | U-H | H | H | N | H | N | U-L | U-L | H | N |
| Austria | L | N | L | N | L | H | H | N | H | S-H |
| Czechoslovakia | L | H | L | S-H | N | H | N | H | N | N |
| Denmark | N | N | N | N | H | N | N | H | N | N |
| France | L | U-H | N | U-H | U-L | H | N | — | N | — |
| Germany | L | N | U-L | N | L | N | U-H | NONE | N | N |
| Greece | N | H | L(C) | H | L | L | N | — | N | — |
| Hungary | L | L | N | N | L | L | N | — | H | H |
| Norway | N | N | L | N | L | L | H | L | L | L |
| Portugal | L | L | L | N | U-L | U-L | H | N | L | L |
| Rumania | L | N | N | N | H | N | H | N | L | H |
| Spain | L | N | L | L | U-L | U-L | L | L | L | N |
| Turkey | U-L | U-L | U-L | U-L | NONE | NONE | — | — | NONE | — |
| United Kingdom | N | H | N | N | H | — | H | — | N | N |

(1) Reported as "Low but sufficient."

(2) High in Medan and Semarang.

H-High L-Low N-Normal U-Unusually S-Seasonally —No information forwarded

Pierce-Arrow Prices Revised Upward

BUFFALO, April 14—Prices on the whole Pierce-Arrow line of passenger cars have been revised upward in accordance with the following schedule:

| Pierce-Arrow Prices | | |
|--------------------------|---------|---------|
| Model | New | Old |
| Series 54 | | |
| Coupe Roadster | \$3,100 | \$2,883 |
| Tourer | 3,150 | 2,983 |
| Spt. Phaeton | 3,350 | 3,283 |
| Club Brougham | 2,850 | 2,528 |
| Sedan | 2,985 | 2,718 |
| Coupe | 2,985 | 2,718 |
| Club Sedan | 3,150 | 2,883 |
| Club Berline | 3,350 | 3,083 |
| Conv. Sedan | 3,450 | 3,183 |
| Touring | 3,450 | 3,133 |
| Sedan | 3,185 | 2,983 |
| E. D. L. | 3,450 | 3,183 |
| Series 53 | | |
| Conv. Roadster | 3,900 | 3,683 |
| Tourer | 3,950 | 3,783 |
| Tourer | 4,250 | 3,650 |
| Spt. Phaeton | 4,150 | 4,083 |
| Club Brougham, 5-pass... | 3,650 | 3,328 |
| Coupe | 3,785 | 3,518 |
| Sedan | 3,785 | 3,518 |
| Club Sedan | 3,950 | 3,683 |
| Club Berline | 4,150 | 3,883 |
| Conv. Sedan | 4,250 | 3,983 |
| Sedan | 3,985 | 3,783 |
| E. D. L. | 4,250 | 3,983 |
| Series 52 | | |
| Sedan | 4,295 | 4,028 |
| Club Sedan | 4,400 | 4,133 |
| Club Berline | 4,600 | 4,333 |
| Sedan | 4,535 | 4,318 |
| E. D. L. | 4,800 | 4,533 |

White to Market 1½-Ton Indiana

A 1½-ton six-cylinder Indiana truck, powered with a 68 hp. engine and having an allowable gross weight of 10,000 lb., will be sold and serviced by the White Co. at a list price of \$885. This new truck, Model 85, will be offered in five wheelbases and a complete line of bodies.

The six-cylinder, seven-bearing Hercules "L" head engine, 3⅔ in. x 4⅓ in., gives a piston displacement of 263 cu. in.

Auburn Profit Slumps

NEW YORK, April 13—Auburn Automobile Co. and subsidiaries report profit for the first quarter of the fiscal year ending Feb. 29 of \$7,959. This is equivalent to 4 cents a share, and compares with earnings of \$202,409 or \$1.06 a share for the corresponding period of last year.

Bendix Elects Kliesrath

NEW YORK, April 14—Victor Kliesrath, chief of the automotive engineering division of Bendix Aviation Corp., was elected to the board of the company yesterday.

C. H. Colvin and M. W. McConkey, former directors, resigned, reducing the number of directors to 15.

DeVaux Prices Up, New Types Added

The Continental-DeVaux Co. has announced a new model known as the 6-80 and which supersedes the former Model 6-75. Wheelbase has been increased from 113 in. to 114 in. and a Continental 40-A 3⅔ x 4 in., 6 cyl. engine has been substituted for the Hall 40-A engine of the same bore and stroke. The new engine develops 75 hp. at 3600 r.p.m. Six body models comprise the line, with the five-passenger four-door sedan being priced at \$845. Price increases on the complete line range from \$50 to \$160. Prices on individual models follow:

| DeVaux Prices | New Model | Former Model |
|--------------------|-----------|--------------|
| Standard coupe ... | \$795 | \$685 |
| Sport coupe | 845 | 745 |
| Sedan, 5-pas.... | 845 | 685 |
| Cust. coupe | 895 | 845 |
| Cust. sedan | 895 | 845 |
| Conv. coupe | 945 | ... |

Air Show Attendance Off

DETROIT, April 13—Total attendance at the Air Show last week was 63,685, some 20,000 less than last year. Sixteen planes were sold during the show at a revenue of approximately \$81,000. Accessory and engine sales during the week were estimated to be in the neighborhood of \$20,000.

Graham to Push Tax Opposition

Will Represent N.A.C.C. Before Senate Committee

WASHINGTON, April 14—George M. Graham, vice-president of the Rockne Motors Corp., will appear for the automotive industry in opposition to the proposed excise taxes on passenger cars, trucks, and accessories. He will make his presentation before the Senate Committee on Finance next Monday in connection with hearings on the revenue bill. Other automotive industries, including motorists' associations, and perhaps interests outside of either the manufacturing or motoring end, will also assail the proposed taxes of 3, 2 and 1 per cent on automobiles, trucks and accessories respectively. Mr. Graham in speaking for the industry will appear as a representative of the National Automobile Chamber of Commerce.

The voice of farmer organizations was raised against the taxes last Monday. Three powerful units of a vast agricultural population informed the committee that the taxes on automobiles, trucks and accessories were knocked out. They pointed out that they would be burdens on the farmers, already suffering extreme losses of values of their products. They also told the committee the taxes are discriminatory. The organizations were the American Farm Bureau Federation, represented by Chester Gray, Washington; the National Grange, represented by Frederic Brenckman, Washington, and the National Farmers Union, represented by its president, John A. Simpson, Oklahoma City, Okla.

"These new taxes are discriminatory and unjust and should be stricken from the bill," declared Mr. Brenckman. "One-fifth of all the automobiles and trucks are on the farms and are no more luxuries than freight cars or locomotives."

Goodrich Elects Two

AKRON, April 13—W. D. Tichnor, president of the Commercial Solvents Company of New York, was chosen a new director of the B. F. Goodrich Rubber Co., and Sidney J. Weinberg of Goldman, Sachs and Company was elevated to the executive committee of the company at a directors meeting in New York Tuesday, officials of the company announced here today.

Freeman Reorganized

DETROIT, April 13—Complete reorganization of the Freeman Motor Truck under the name of Freeman Quadrive Corp., has been announced by Major Maurice Bollstrom, president

and general manager. The factory is being moved to Pontiac and will be located in the former Eaton Axle and Spring plant. The following officers have been named: Lewis C. Jarrendt, vice-president and treasurer; C. Earl Currah, secretary and general counsel; William F. Dicks, sales and advertising manager, and Clifford A. Pyrne, factory manager. It is understood that production will begin in 90 days.

DeSoto Deliveries Gain

DETROIT, April 13—DeSoto retail deliveries for the week ending April 9 were 1601, or 43 per cent greater than previous week with a total of 1118, and 95 per cent greater than corresponding week last year with 822, and was second largest week in history of DeSoto Motor Corp. Mr. Foy stated that factory has over twice as many orders for immediate shipment to dealers as for same period last year.

To Begin Production

CHICAGO, April 12—Safety Free Wheeling Company will start production this week on its new free-wheeling automatic clutch control.

Libbey Reports Profit

TOLEDO, April 13—Libbey Owens Ford Glass Co. reports \$44,230 net profit after charges for first quarter, compared with a loss of \$188,072 for same period last year.

Stockholders in annual meeting today elected W. W. Knight a director to replace J. C. Blair, former president of Libbey-Owens, and reelected fourteen other directors. The officers were reelected.

Safety glass sales have increased and company showed gain in plate glass sales due to its contract with General Motors while rest of industry was off 18 per cent last year, President John D. Biggers reported. He said only 20 per cent of automobile market for safety glass was now developed.

Boeing Completes Contract

Deliveries on a contract calling for 135 Wasp-powered P-12E and P-12F type airplanes for the Army Air Corps were completed recently, by the Boeing Airplane Co., when fifteen airplanes were ferried south from Seattle to March Field, Riverside, Calif.

Air Transport Scheduled Operations 1931-1930

Domestic

| | 1931 | 1930 |
|-----------------------|---------------------------|---------------------------|
| Miles flown | 41,755,417 ⁽¹⁾ | 31,992,634 ⁽²⁾ |
| Passengers | 469,981 | 374,935 |
| Express, pounds | 788,059 ⁽³⁾ | 2,760,207 ⁽⁴⁾ |
| Mail, pounds | 9,097,411 | 7,985,010 |
| Mail payments | \$19,900,250.88 | \$14,702,655.71 |
| Passenger miles | 106,442,375 | 84,015,572 |

Foreign (Canada, Latin America, Etc.)

| | 1931 | 1930 |
|-----------------------|------------|------------|
| Miles flown | 4,630,570 | 4,952,569 |
| Passengers | 52,364 | 42,570 |
| Express, pounds | 363,289 | 109,048 |
| Passenger miles | 13,526,202 | 19,732,677 |

Domestic and Foreign

| | 1931 | 1930 |
|-----------------------|---------------------------|---------------------------|
| Miles flown | 47,385,987 ⁽¹⁾ | 36,945,203 ⁽²⁾ |
| Passengers | 522,345 | 417,505 |
| Express, pounds | 1,151,348 ⁽³⁾ | 2,869,255 ⁽⁴⁾ |
| Passenger miles | 119,968,577 | 103,747,249 |

Miscellaneous Flying Operations

| | 1931 | 1930 |
|----------------------------|------------|-------------|
| Miles flown | 94,343,115 | 108,269,760 |
| Passengers: | | |
| Carried for hire | 1,430,052 | 1,840,492 |
| Carried for pleasure | 437,465 | 457,849 |
| Total passengers | 1,867,517 | 2,298,341 |

- ⁽¹⁾ Does not include 194,419 miles flown in carrying private freight and express on schedule.
- ⁽²⁾ Includes 280,093 miles flown in carrying private freight and express on schedule.
- ⁽³⁾ Does not include 1,532,156 pounds of privately carried freight and express on schedule.
- ⁽⁴⁾ Includes 2,400,684 pounds of privately carried freight and express on schedule.

Automobile Financing in February, 1932, Compared with Preceding Months

Monthly statistics on automobile financing, based on data reported to the Bureau of the Census by 365 automobile financing organizations, are presented in the table below. These figures include complete revisions to date.

| Year and Month | WHOLESALE FINANCING VOLUME IN DOLLARS | Number of Cars | TOTAL | | | | | | RETAIL FINANCING | | | | | | UNCLASSIFIED | | |
|----------------------|---|-------------------|--------------------|--------|------------|-------------------|--------------------|------------|-------------------|--------------------|------------|--------------------|-----------------|------------|--------------------|-----------------|------------|
| | | | Volume and Average | | | NEW CARS | | | USED CARS | | | Volume and Average | | | Volume and Average | | |
| | | | Total | Amount | Per Car | Number of Cars | Volume and Average | Per Car | Number of Cars | Volume and Average | Per Car | Number of Cars | Total Amount | Per Car | Number of Cars | Total Amount | Per Car |
| 1932 | | | | | | | | | | | | | | | | | |
| January* | \$34,841,766 | 122,344 | \$44,628,529 | \$365 | | 41,375 | \$23,475,671 | \$567 | 77,321 | \$19,974,286 | \$258 | 3,648 | \$1,178,572 | \$323 | | | |
| February** | 33,278,382 | (a) 123,208 | 44,631,230 | 362 | | 40,752 | 23,542,109 | 578 | 78,422 | 19,813,526 | 253 | 4,034 | 1,275,595 | 316 | | | |
| Total (2 Mos.) | \$68,120,148 | 245,552 | \$89,259,759 | \$364 | | 82,127 | \$47,017,780 | \$573 | 155,743 | \$39,787,812 | \$255 | 7,682 | \$2,454,167 | \$319 | | | |
| 1931 | | | | | | | | | | | | | | | | | |
| January | \$40,164,672 | 160,490 | \$61,691,837 | \$384 | | 58,499 | \$32,945,588 | \$563 | 97,834 | \$27,236,324 | \$278 | 4,157 | \$1,509,925 | \$363 | | | |
| February | 49,812,959 | 172,958 | 66,130,134 | 382 | | 67,599 | 36,854,428 | 545 | 100,696 | 27,707,242 | 275 | 4,663 | 1,568,464 | 336 | | | |

* Revised.

** Preliminary.

(a) Of this number 33.08 per cent were new cars, 63.65 per cent used cars, and 3.27 per cent unclassified.

Brings Home the Bacon

MILWAUKEE, April 11—Samuel A. Fulton, president of the Fulton Co., manufacturer of automotive equipment, has returned from a 7000-mile trip along the Pacific Coast with a volume of orders that is making possible normal production with all of the 100 employees recalled to work.

Chevrolet Shifts Two

JANESVILLE, WIS., April 11—Robert R. Bruner, zone service manager of Chevrolet, with headquarters at the Janesville assembling plant, has been promoted and transferred to Flint, Mich., to become regional parts and service manager. His place here is taken by E. L. Harrig, until now at the Omaha plant.

William C. Gewalt

RACINE, WIS., April 11—William C. Gewalt, vice-president and works manager of the Twin Disc Clutch Co., and widely known as an inventive genius, died April 8 following an illness of four months. He was 44 years of age and a native of Germany, coming to this country in 1909. Before assisting in the formation of the Twin Disc Co. he was an engineering executive of the Hamilton Beach Mfg. Co. and later of the Mitchell Motor Car Co., Racine.

Budd Schedules Up

Increases in production schedules for April and May, as a result of orders from automotive manufacturers for wheels, brakes and brake drums, are announced by Budd Wheel Co. These increased schedules call for an April production larger than that of any month since October, 1931, and May volume greater than that of any month since last May.

Plans Canadian Plant

CHICAGO, April 11—Perfect Circle Co., Hagerstown, Ind., has announced plans for a branch factory at Toronto. The new plant which is expected to be in operation within sixty days, will have a capacity of approxi-

mately 100,000 finished piston rings a month. Canadian sales of the company more than doubled during 1931 and the new manufacturing unit will supply requirements of the company's jobbers, in all principal cities of the Dominion.

May Restrict Use of Gasoline in Chile

The limitation of gasoline consumption in Chile has been proposed to the National Congress as a method of restricting the export of gold from that country, according to a report to the Department of Commerce from Assistant Commercial Attache Harold M. Randall, Santiago.

Chilean gasoline imports have been greatly increased and it is said that its consumption has not been reflected in industrial progress but is due to increased use of pleasure vehicles.

Allis Backlog Down

CHICAGO, April 11—Unfilled orders of the Allis Chalmers Mfg. Co. of March 31 totaled \$7,221,000, compared with \$7,363,000 on Feb. 29, 1932, orders at the end of March showed a decline of \$668,000 from a year ago.

Cadillac Salon Opened

DETROIT, April 11—Cadillac Motor Car Co. has announced the opening of a permanent Cadillac-LaSalle Fleetwood Salon in the General Motors Bldg.

Stewart-Warner Reelected

CHICAGO, April 11—Retiring directors were reelected and two additional directors were authorized by Stewart Warner Corp. recently. Joseph E. Otis, vice-president of the Alemite Corp., was elected to fill one position and the other will be filled later.

H. J. Cupper Resigns

H. J. Cupper has resigned as sales promotion manager of the Cadillac Motor Car Co.

Noblitt Volume at Peak

CHICAGO, April 11—Noblitt-Sparks Industries, Inc., has recently obtained the largest volume contract in its history, under which it will supply its newly developed muffler to a leading manufacturer in the low priced motor car field. Although the identity of the automobile producer could not be officially obtained, reports of La Salle St. are in general agreement that it was the Ford Motor Co.

Backstay Welt Profits

CHICAGO, April 11—Backstay Welt Co. reports consolidated earnings after all charges except federal taxes of \$3,753 for 1931 as compared with profit of \$117,320 before taxes and \$109,957 after taxes in 1930.

Chicago Ford Resumes

CHICAGO, April 11—The Ford Motor Company's Chicago plant was to resume operations today or tomorrow on new model cars. All materials are on hand for production with the exception of the eight-cylinder motors, expected to arrive next week.

Dispatch-Tow Prices Down

SPRINGFIELD, MASS., April 11—A reduction of \$15 on each of its two models of Indian Dispatch-Tow three-wheeled motorcycle vehicles for automobile service has been announced by the Indian Motorcycle Co. New prices are \$450 for the Dispatch-Tow with 45 cu. in. Indian engine and \$435 for the model with 37 in. engine.

Modine Dividend Cut

CHICAGO, April 11—Annual dividend of Modine Mfg. Co. has been reduced to a 60-cent annual basis from previous \$1 rate by declaration of quarterly dividend of 15 cents, payable May 1. Reductions of 25 cents were made in each of the two preceding quarters, lowering the rate from the former 75 cent level.

G.M. Southeastern Sales Co. Merged

Becomes Part of New B.O.P. Organization in Detroit

CHARLOTTE, N. C., April 11—The Southeastern Sales Co. of Charlotte, which has had charge of Cadillac, LaSalle, Buick, Oldsmobile and Pontiac automobile sales in the Southeast, has been absorbed by the Buick-Olds-Pontiac Sales Co.

Lee A. Folger, who has been head of the Southeastern Sales Co., announced yesterday that he will remain as manager of the Charlotte zone office of the new company. This zone office will direct the sales of General Motors cars in the Carolinas.

C. A. Murphy has been appointed assistant sales manager to replace G. F. Daily, who has resigned from that position.

The Charlotte zone office of the new corporation will operate in the same way as the Southeastern Sales Co. has operated, Mr. Folger said, and there will be no change in policy, and but few personnel changes, it was announced.

Aero Directory Published

PHILADELPHIA, April 11—The 1932 edition of the Chilton Aero Catalog and Directory, the standard guide-to-purchases of the aviation industry, and a useful compilation of engineering and business information about the industry, was published this week. In addition to bringing up-to-date tabular information and specifications of the world's airplanes and engines, the 1932 edition has been more widely illustrated than the 1931 edition. The recent developments of

air transport are summarized in convenient form. Maps show the location of federal aids to air navigation, teletype stations, scheduled passenger routes, radio stations and radio range beacon bands. Records for airplane speed and Schneider Trophy information are included. The section devoted to marketing information includes registration of aircraft, pilots, gliders, glider pilots, mechanics, etc. The relative position of the seven great "Air Powers" of the world is shown graphically. The Chilton Aero Catalog and Directory is available to a restricted group at \$1 per copy.

General Parts Shows Loss

CHICAGO, April 11—Annual report of General Parts Corp. for 1931 reveals net loss of \$23,253 after all charges including depreciation as compared with a net profit of \$118,240, equal after preferred dividends to 59 cents a share on 102,100 common in 1930. Consolidated balance sheet Dec. 31 shows current assets \$930,153 against current liabilities \$372,889. Profit and loss deficit totaled \$85,686 at year-end after the inclusion of capital surplus.

Dodge Names Two

C. W. Scott has been appointed sales representative for Dodge Brothers Corp. in the newly created Springfield (Mass.) zone, comprised of all the former South Boston zone, except the Boston dealer's territory, according to an announcement by William J. Case, New York regional manager. Mr. Scott succeeds Frank Marr who has been appointed Boston city manager. The appointment of Walter E. Shanahan as regional truck representative in the New York region succeeding J. D. Burke, recently named director of truck sales at the factory in Detroit, has also been announced.

Nash Earns 7 cts. Per Share

First Quarter's Operations Are Below Last Year

CHICAGO, April 11—Nash Motor Co. has declared the regular quarterly dividend of fifty cents a share and announces net profits for the quarter ended February 29, 1932, were \$211,927 as compared with net profit of \$1,099,194 in the corresponding quarter a year ago. Net for the three-month period amounted to 7 cents a share on 2,730,000 shares against 40 cents a year ago.

President E. H. McCarty stated that shipments of the company for March, the first month of the second quarter, totaled more than the combined shipments of December, January and February, reflecting the stimulus on business following presentation of new models. As of February 29, 1932, the company reported cash and government securities on hand amounting to \$33,401,022.

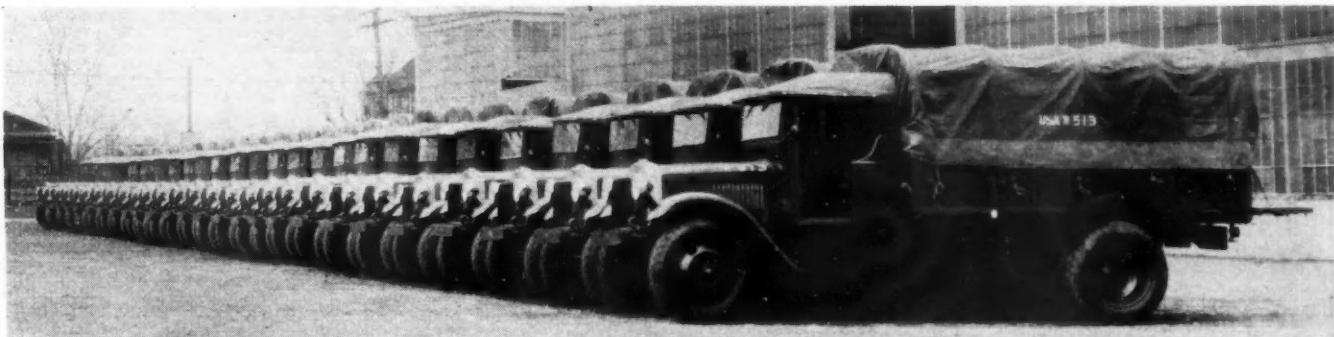
Accuralite Sales Increase

The Piston Ring Co., Muskegon, Mich., reports that sales of Accuralite pistons during March exceeded February sales by 50 per cent. The acquisition of the Accuralite Co. by the Piston Ring Co. was announced Feb. 28. The entire Accralite line of pistons (both Lynite and cast iron) pins and cylinder sleeves are now marketed as "Sealed Power" products.

Henry Krohn Resigns

Henry Krohn has resigned as vice-president and general manager of the Federal Motor Truck Co.

Twenty-six Rebuilt Army Trucks for the Philippines



From a number of old trucks the government shops at Holabird Quartermasters Depot at Baltimore have salvaged parts from which they built 26 new units. They are referred to as Class B Third Series. Each part was subjected to rigid tests before it was accepted. The units were powered by new six-cylinder 105-hp. Continental engines. The rebuilt trucks cost \$2,500 each including the new engines and necessary parts, effecting a saving of approximately \$90,000. They have been shipped to the Philippines.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, April 14—Retail sales of clothing and some other seasonal merchandise were aided last week by the more seasonable weather; but wholesale lines were dull, and the heavy manufacturing industries showed no improvement. The absence of the usual degree of seasonal improvement in general industry is attributed in part to the delay of spring weather, the deferring of automobile purchases until the new Ford models made their appearance, and the hesitancy arising out of the controversy in Congress regarding the new tax program.

DEPARTMENT STORE SALES

Sales of department stores during March, according to the Federal Reserve Board, were 20 per cent below those a year ago. Sales during the first quarter of this year were also 20 per cent below those a year ago.

CAR LOADINGS

Railway freight loadings during the week ended March 26 totaled 561,118 cars, which marks a decrease of 23,516 cars below those during the preceding week, a decrease of 177,762 cars below those a year ago, and a decrease of 324,206 cars below those two years ago.

ELECTRICITY PRODUCTION

Production of electricity by the electric light and power industry of the United States during the week ended April 2 was 11.9 per cent below that a year ago.

LUMBER PRODUCTION

The excess of orders above production in the lumber industry during the week ended April 2 amounted to 20 per cent, which is not so great as it has been in many recent weeks. Both lumber production and orders during that week were about 44 per cent below last year's levels.

CRUDE OIL OUTPUT

Average daily crude oil production for the week ended April 2 amounted to 2,154,000 barrels, as against 2,163,050 barrels for the preceding week and 2,252,100 barrels a year ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended April 9 stood at 62.5, as against 62.9 the week before and 63.1 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended April 6 were 8 per cent below those a year ago.

STOCK MARKET

Further declines occurred on the stock market last week, accompanied by a falling off in the bond and commodity markets. The proposals included in the tax legislation now before the Senate to impose a heavy tax on stock transfers and to make dividends subject to the normal income tax were largely responsible for the recession. A large number of prominent stocks reached record low levels during the week, and declines were shown all around. Trading was on a moderately large scale.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended April 6 showed increases of \$2,000,000 in holdings of discounted bills and of \$13,000,000 in holdings of Government securities. Holdings of bills bought in the open market decreased \$8,000,000. The reserve ratio on April 6 stood at 70.8 per cent, as against 70.9 per cent a week earlier and 70.6 per cent two weeks earlier.

Vauxhall Shows Profit

LONDON, April 1 (by mail)—The report and accounts for 1931 issued today by Vauxhall Motors, Ltd., the British subsidiary of General Motors Corp., show a profit for the year of £56,039 against a loss of £88,536 in 1930. The directors state that in spite of an increase in turnover of nearly 57 per cent the value of the inventory on hand and in process is 32 per cent lower than in the previous year, while indebtedness to suppliers and General Motors Corp. has been reduced by £195,400. Sales in the home markets in 1931 showed an increase of more than 50 per cent over the previous year, while in the export field sales increased no less than 657 per cent over 1930.

It may be recalled that during 1930-1931 the Vauxhall plant at Luton was reorganized to produce Chevrolet cars and trucks, as well as Vauxhall cars, and has latterly introduced new truck models called the Bedford.

Morris Profits Down

LONDON, March 31 (by mail)—The accounts of Morris Motors, Ltd., published today show a decrease in profits for the year ending Dec. 31, last. The gross profit is £1,020,000 against upwards of £1,600,000 in 1930, and the net profit £568,880 against £1,055,402. It is proposed to reduce the dividend on the ordinary shares (which are all held by Sir William Morris) from 10 per cent to 5 per cent free of tax, and to write down goodwill, etc., by £100,000 (against £391,043), leaving the "carry-forward" almost unchanged at £259,331 (against £258,112).

The directors state in their report that, in view of the reserves created in the past, they decided to meet the general economic conditions by establishing the selling prices of the 1931-32 models at such figures as would show the lowest margin of profit consistent with business prudence, and that the demand for all models has been most satisfactory.

Roby Event Sanctioned

CHICAGO, April 11—The contest board of the American Automobile Association in Washington, D. C., governing body of auto racing, has awarded a sanction for the opening of the new Roby-Chicago speedway Sunday, May 8. Coming ahead of the Indianapolis classic Memorial day, the Roby event is expected to attract many nationally prominent drivers entered in the Hoosier grind.

Peerless Reports Loss

NEW YORK, April 12—Peerless Motor Car Corp. reports net loss for the quarter ended March 31 of \$67,001. This compares with a net loss of \$43,083 in the preceding quarter, and a loss of \$114,221 in the first quarter of 1931.

Steel Market Reacts Slowly

Automotive Releases Fail to Stir Ingot Production

NEW YORK, April 14—Improvement noted in the rate of operations of rolling mills as the result of automotive releases is only slowly making itself felt in the rate of ingot output by which activity in the industry as a whole is measured. Mahoning and Shenango Valley sheet mills are working 25 per cent of their capacity this week and strip mills 30 per cent. Estimates of the rate of ingot output for the country as a whole are between 22 and 23 per cent. Distribution of orders for rolled steel among the different districts is uneven and some mills are making more marked headway in accumulating orders than others, but sentiment in general is decidedly hopeful. Slow as is the growth in business, it is felt that for that very reason it will be more enduring. In connection with the leading interest's unfulfilled tonnage statement, which disclosed a further decline of 73,216 tons in the backlog, it is pointed out that advances announced in a number of steel products for second quarter, aside from business conditions in general, resulted in a minimum of new contracting, the market generally being on a basis in which there is virtually no forward buying. Prices generally are characterized as holding steady, but in the Detroit market considerable pressure is being brought to bear and buyers of anything like round lots indulge in much more shopping than has been in evidence of late.

Pig Iron—The Chicago market declined 50 cents a ton, malleable and No. 2 foundry being quoted at \$16, Chicago district furnace. Cleveland district furnaces quote \$15 for nearby shipments. Moderate improvement in automotive foundry demand is noted in Cleveland and Detroit, but on the whole shipments called for are still below the expectations of sales agencies.

Aluminum—Quiet and easy. The American Die Casting Institute, in cooperation with the Department of Commerce, is undertaking an extensive survey of the die-casting industry through which an important part of the automotive consumption of aluminum, especially that in piston form, passes for fabricating.

Copper—Utah Copper Co., one of the "low cost" producers has just reported its actual cost, exclusive of depreciation, at 6.59 cents per pound in a market at which offerings at 5 1/4 cents delivered Connecticut Valley, go begging for buyers.

Tin—Lower prices have more nearly paralyzed than encouraged buying. Spot Straits tin at the week's beginning was quoted at 18 1/2 cents.

Lead—Fairly active at unchanged prices.
Zinc—Steady and quiet.

Briggs Reports Profit

NEW YORK, April 12—Briggs Mfg. Co. reports net income for 1931 of \$683,932. This compares with earnings of \$4,035,912 in the previous year.

'Motors' Sales Up from February

But Show Big Drop from March of Last Year

NEW YORK, April 11—Sales of General Motors cars to consumers in the United States during March amounted to 48,717, as compared with 46,855 in February, and with 101,339 in March of last year.

Sales to dealers in the United States by General Motors manufacturing divisions were 48,383, as compared with 52,539 in February, and with 98,943 in March, 1931. It will be noted from these figures that dealer inventories in the United States during the month of March showed a slight reduction from the previous month.

Total sales of cars by manufacturing divisions to all dealers in the United States, Canada and foreign countries were 59,696 during March, as compared with 62,850 in February, and with 119,195 in March, 1931.

Penry Made Auburn Director

E. O. Penry, vice-president in charge of manufacturing of the Auburn Automobile Co., has been elected a director of the company. Mr. Penry has been with Auburn 21 years, beginning as a car tester. In his career he progressed from final tester to assistant superintendent, to superintendent and then to his present activity.

ing Process in Plain Bearings), by Dr.-Ing. Walter Nuecker. Published by VDI Verlag, Berlin NW-7, Germany.

The Analysis of Cyanide Silver-Plating Solutions, by R. M. Wick. Research Paper No. 384 of the Bureau of Standards. Obtainable from the Superintendent of Documents, Washington, D. C. (10 cents).

Thermal Expansion of Gasoline from 0 to 30 deg. C., by C. S. Cragoe and E. E. Hill, Research Paper No. 383 of the Bureau of Standards. Obtainable from the Superintendent of Documents, Washington, D. C. (5 cents).

Thermal Expansion of Heat-Resisting Alloys Nickel-Chromium, Iron-Chromium, and Nickel - Chromium-Iron Alloys, by Peter Hidnert. Research Paper of the Bureau of Standards No. 388. Obtainable from Superintendent of Documents, Washington, D. C. (25 cents).

A Retail Selling Stunt



Capitalizing on women's taste for new fashions, G. E. Clarke, general manager of the Hupmobile Michigan Sales Corp., factory distributors in Michigan, is staging a style salon in his salesroom to attract retail buyers. A corner of this unique exhibit is shown in this photograph. The Style Salon is the first attempt in Detroit's retail circles to actively tie up woman interest in clothing with style in motoring.

| G.M. Sales to Consumers in United States | | | | |
|--|--------|---------|---------|---------|
| | 1932 | 1931 | 1930 | 1929 |
| January | 47,942 | 61,566 | 74,167 | 73,989 |
| February | 46,855 | 68,976 | 88,742 | 110,148 |
| March | 48,717 | 101,339 | 123,781 | 166,942 |

| G.M. Sales to Dealers in United States | | | | |
|--|--------|--------|---------|---------|
| | 1932 | 1931 | 1930 | 1929 |
| January | 65,382 | 76,681 | 94,458 | 95,441 |
| February | 52,539 | 80,373 | 110,904 | 141,222 |
| March | 48,383 | 98,943 | 118,081 | 176,510 |

| G.M. Total Sales to Dealers in U. S. and Canada Plus Overseas Shipments | | | | |
|---|--------|---------|---------|---------|
| | 1932 | 1931 | 1930 | 1929 |
| January | 74,710 | 89,349 | 106,509 | 127,580 |
| February | 62,850 | 96,003 | 126,196 | 175,148 |
| March | 59,696 | 119,195 | 135,930 | 220,391 |

Unit sales of Chevrolet, Pontiac, Oldsmobile, Buick, LaSalle and Cadillac passenger and commercial cars are included in the above figures.

Casing Output Up in February

But Shipments Are Smaller and Inventories Rise

NEW YORK, April 11—Production of tire casings for February has been estimated by the Rubber Manufacturers Association, Inc., at 3,871,220, as compared with 3,462,485 for January, and with 3,985,345 for February, 1931.

Shipments during the month were 2,552,861, as compared with 3,253,086 in January, and with 3,401,683 in February of a year ago.

As a result of increased production and decreased shipments during the month, inventories as of Feb. 29 were placed at 9,172,245 units, as compared with 7,911,771 on January, and with 9,535,650 on Feb. 28 last year.

Publications Received

Cotton Cloth for Rubber and Pyroxylin Coating (Commercial Standard No. CS32-31). Obtainable from the Superintendent of Documents, Washington, D. C., at 5 cents a copy.

Motor Gasoline Survey of August, 1931, Part I, Specification Data, by A. J. Kraemer and E. C. Lane. Bureau of Mines, Washington, D. C.

Die Bereifungsfragen beim Lastkraftwagen (The Motor Truck Tire Question), by L. Betz, published by Industrie-Verlags und Druckerei Gesellschaft m.b.H., Stuttgart, Germany. An attack on the German motor vehicle regulations of July 15, 1930, which require that all motor trucks in service on public roads must be equipped with pneumatic tires.

Charakteristik von Kolbenmaterialen (Characteristics of Piston Materials) by Erich Wilh. Heinr. Koch. Thesis presented to the Technical College of Aix-la-Chapelle for the degree of doctor of engineering.

Ueber den Schmievorgang im Gleitlager (Investigation of the Lubricat-

+ + CALENDAR OF COMING EVENTS + +

FOREIGN SHOWS

| | |
|---|----------------|
| Tel. Aviv, Palestine (Levant Fair) | April 7-30 |
| Milan, International Automobile Salon | April 12-27 |
| Zagreb, Jugoslavia, Automobile Salon | April 23-May 2 |
| Peznan, Poland, International Fair | May 1-8 |
| Dublin, Commercial | May 4-7 |
| Budapest, International Fair | May 7-16 |
| Belfast, Commercial | May 25-28 |
| Bordeaux, Fair | June |
| Cork, Commercial | June |
| Inverness, Commercial | June 21-24 |
| Southhampton, Commercial | July 5-9 |
| Llandrindod, Wales, Commercial | July 20-22 |
| London, Olympia Show | Oct. 13-22 |
| Glasgow, Scottish Motor Show | Nov. 11-19 |

CONVENTIONS

| | |
|---|--------------|
| American Welding Society, Annual Meeting, New York City | April. 27-29 |
|---|--------------|

Couzens Hearings Ended

WASHINGTON, April 12—The wind-up of hearings on the Couzens bills to regulate the operation of motor buses and trucks took place before the Senate Committee on Interstate Commerce and left unchanged the general impression that regulatory legislation will not be enacted at the present session of Congress. Many do not believe a bill will even be reported out. It is considered to be especially doubtful that any sort of truck legislation will be enacted. Senator Couzens himself gave no indication as to what action the committee may take with regard to making a report or when a bill in its final draft would be ready. An abundance of testimony for and against regulation was taken during the two months over which hearings extended.

"These have given us a vast amount of data to be considered," said Senator Couzens. "It must be examined carefully. Then, there is the necessity of consultation with the drafting counsel of the Senate in drawing up another bill if the committee decides to report such a measure. It all takes time, so it is difficult now to say when a bill can be made ready if that is the action to be taken."

Chrysler Shows Gains

DETROIT, April 11—New cars registration figures from 25 states for February show all divisions of Chrysler Motors Corp. with 15.3 per cent of the total for the industry against 7.6 per cent last year, according to a statement by B. E. Hutchinson, vice-president and treasurer of the organization.

The statement points out that Chrysler Motors Corp. registrations in

| | |
|--|------------|
| American Society Mechanical Engineering (Management Div.) Philadelphia | May 2-6 |
| American Gear Manufacturers Asso., Sixteenth Annual Meeting, Cleveland | May 12-13 |
| U. S. Chamber of Commerce, San Francisco, Calif. | May 16-20 |
| National Battery Mfrs. Asso., Chicago, Ill. | May 19-20 |
| American Society Mec. Eng. (Natl. Aeronautic Meeting) Buffalo | June 6-8 |
| American Society Mec. Eng. (Natl. Oil & Gas Meeting) State College, Pa. | June 8-11 |
| National Team & Motor Truck Owners Assn., Detroit | July 17-19 |
| National Safety Council, Washington, D. C. | Oct. 3-7 |

RACES

| | |
|--------------------|---------|
| Indianapolis | May 30 |
| Detroit | June 5 |
| Altoona | June 12 |
| Roby, Ind. | June 19 |
| Altoona | Sept. 5 |

these states in February were 125.8 per cent of their registrations in the same states in 1931 and 145.5 per cent of registrations in the same states in January this year, against only 62.1 per cent for the industry as a whole a year ago and 109.6 per cent compared with January.

Hearing Date Set

WASHINGTON, April 11—Senate Finance Committee has set Monday, April 18, as the date to hear protests against the House bill putting excise taxes on the automotive industry, and under the plan of the Senate committee only one representative will appear for the industry. Probably he will be George C. Graham, vice-president, Rockne Motors Corp. Rubber, parts and accessories manufacturers, as well as different motorists' organizations, will also make protests against the proposed taxes.

New P. & W. Engines

NEW YORK, April 13—Pratt & Whitney Aircraft Co., Hartford, Conn., has announced a new series of radial, air-cooled aircraft engines of higher horsepower than the former series. The new series of Wasp, Hornet and Wasp Junior engines develop higher horsepower through increased and improved supercharging, higher compression ratios, increased strength of stressed and wearing parts and improved cooling.

The new Wasp Junior develops from 300 to 425 horsepower, with the Wasps developing from 420 to 550 and the Hornets from 525 to 650 horsepower. All models weigh less than one and a half pounds per horse-

power. Additional accessories are utilized on the higher horsepower engines such as deflectors and oil regulators.

Oil, Gas Power Meeting Planned

NEW YORK, April 12—The American Society of Mechanical Engineers has announced that the fifth national oil and gas power meeting will be held at State College, Pa., June 8-11. The tentative program follows:

Wednesday Morning (June 8)—"Problems in Preheating of Oil," by Edward Adams Richardson, Bethlehem, Pa. "Characteristics of Jerk-Pump Injection Systems," by O. F. Zann, Pennsylvania State College.

Wednesday Afternoon—"Fuel Spray Formation," by Dana W. Lee, Langley Field, Va. "Penetration of Oil Sprays," by P. H. Schweitzer, Pennsylvania State College. "High-Speed Engines," by Julius Kuttner, Consulting Editor, Diesel Power.

Wednesday Evening—Get-together.

Thursday Morning—"Metallurgical Problems of Diesel Engines," by Russell J. Allen, Worthington Pump & Machinery Corp. "Fuel Injection in Gas Engines," by E. G. Beardsley and J. N. Mackendrick.

Thursday Afternoon—Picnic.

Thursday Evening—Card party.

Friday Morning—"Diesel Power Cost Committee Report." "Diesel Fuel Research Committee Report.

Friday Afternoon—"Golf tournament.

Friday Evening—Banquet. "Use and Abuse of Gasoline," by C. M. Allen, Professor of Hydraulic Engineering, Worcester Polytechnic Institute, and V.P., A.S.M.E.

Saturday Morning—"Burning Heavy Oil in Diesel Engines," by H. W. Stalnaker, Construction Engineer, Osceola, Iowa. "Inertia Supercharging of Engine Cylinders," by E. S. Dennison, Westinghouse Electric & Manufacturing Co.

Market Data Published

WASHINGTON, April 14—Available data indicating the location, size and purchasing power of domestic markets for the products of American industry are presented in a report, "General Consumer Market Statistics," made public by the Department of Commerce today.

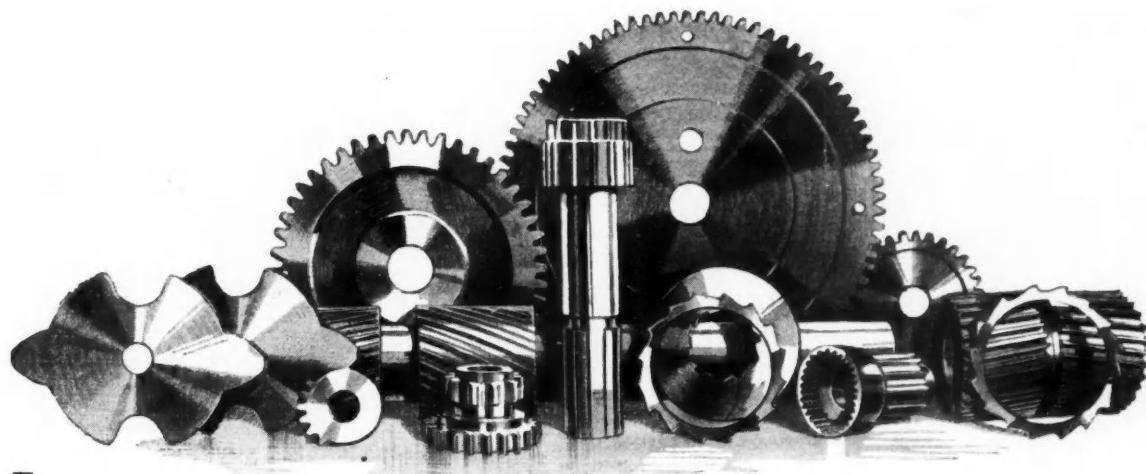
The report is published as the first supplement to the "Market Data Handbook of the United States," recently made available, and was prepared by Charles B. Eliot, domestic regional division, under the direction of E. F. Gerish.

Hupp Entered at Indianapolis

DETROIT, April 11—The Hupp Motor Car Co. has formally announced that it will enter a car bearing the Hupmobile name in the Indianapolis Memorial Day 500-mile race.

Develops New Carbide

NEW YORK, April 11—Thomas Prosser & Son has developed a new grade of Widia cemented carbide cutting material, especially designed for machining steel.



VERSATILITY

Plus: HIGH PRODUCTION

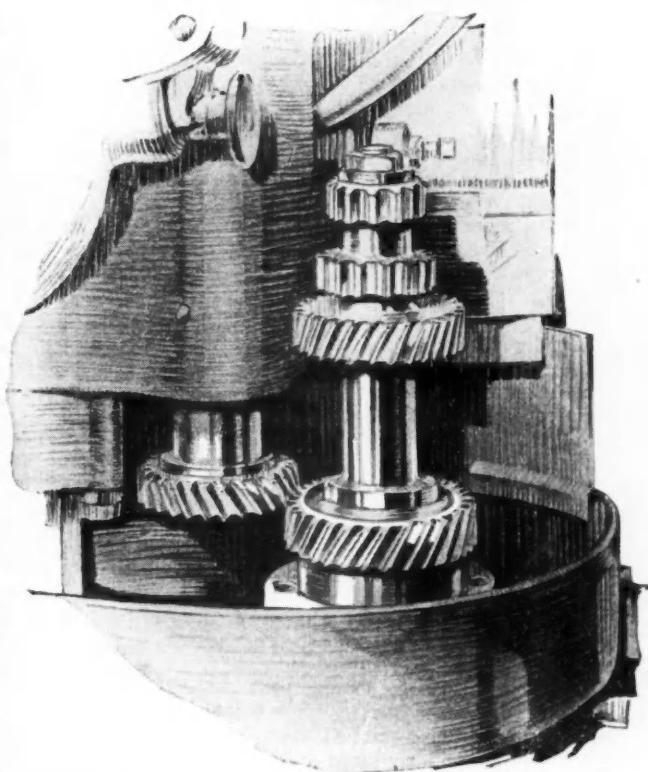
Users of the Gear Shaper know that a change in the design of their product does not lessen the advantages of the Gear Shaper, because one of its Cardinal features is:

VERSATILITY

The Gear Shaper possesses all of the advantages of a special purpose machine:—controlled precision, high-production and low cost per piece,—without its disadvantages.

Whether or not you think your work belongs on the Gear Shaper—if you are cutting teeth on internal or external gears, cutting cams or ratchets, splines, etc., etc.—you will be interested in the booklet: "The Practical Art of Generating." Just ask for your copy. Write: The Fellows Gear Shaper Company, 78 River Street, Springfield, Vermont (or 616 Fisher Building, Detroit, Michigan).

. . . But Without
Compromise of
Either



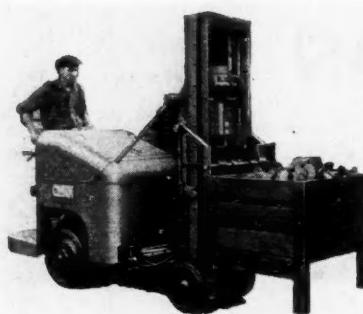
FELLOWS
~ GEAR SHAPERS ~

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Clark Tructractor

A lifting and tiering truck that will pick up loads with 2 in. under-clearance is announced by the Clark Tructractor Co., Battle Creek, Mich. It differs from the usual lift truck in that the load is carried on tapered steel fingers with a standard length of 26 in., which touch the floor in down position. Fingers tilt back slightly in first 5 in. of rise, insuring balance for the load.



Flexibility is secured by four-wheel steer and rear-wheel drive. The 2-ton model has a turning radius of 89 in.; 3-ton, 98 in. It is gas-powered for continuous operation. Maximum lifting and carrying capacity is assured by the powerful hydraulic lift, mounted over 15 in. by 7 in. rubber tires. Speed per hour is from 1 to 6 miles.

While it is capable of tiering to a height of 50 in., the low overall height of the machine (77 in.) makes it suitable for loading box cars. Special machines with greater tiering height to meet special conditions are built by the manufacturer on this same chassis.

Milburn Type HMS Welding Torch

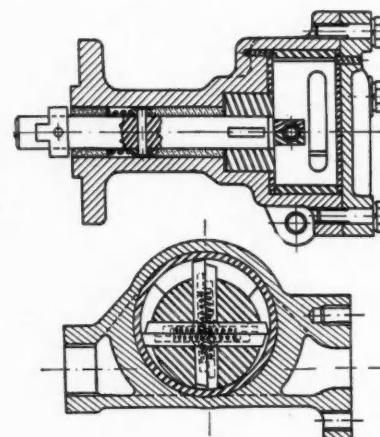
The Alexander Milburn Co., Baltimore, Md., has placed on the market a new welding torch known as the Type HMS. It is recommended for all types of welding. Copper swaged welding tips are usually furnished, but they may be removed from the torch handle and replaced by extensions of various lengths.

These extensions are light, but unbreakable nickel-silver tubes utilizing Milburn standard Type FX and UB welding tips. The extensions are also interchangeable with Airco Davis-Bournonville welding torch Style 8800, etc.

Evans Water Pump

Evans Appliance Co., Detroit, Mich., has placed on the market a water pump of the floating-vane, rotor type, of which two sectional views are shown herewith. It is particularly adapted for use with marine engines. One of its features is the manner in which the pump chamber is sealed against leakage. Oil under pressure is applied to the pump shaft, the oil serving the double purpose of lubricating the bearing and sealing the pump chamber. To prevent oil from getting into the pump chamber a hardened steel collar is pressed on the shaft, which rides against a high-lead bronze bushing, against which it is held by a spring.

The pump is claimed to maintain its priming capacity indefinitely, for the reason that the vanes are maintained in contact with the ends of the pump chamber by means of a spring,



which compensates for any wear. This feature of the design, that the vanes are pressed against the chamber walls by springs, tends to reduce the wear of the pump due to sand or other foreign material passing through it. The pump has a capacity of more than 10 gal. per min. at 2000 r.p.m., with free discharge, the rate of discharge, of course, being substantially proportional to the speed.

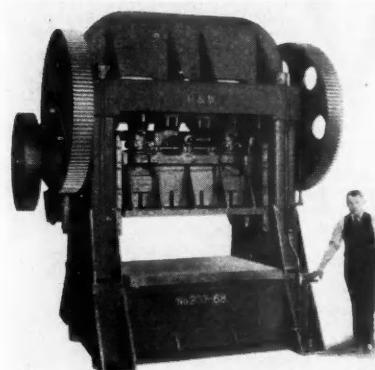
All-Steel Straight-Sided Press

The 350-ton, all-steel, double-crank, straight-sided press, double geared, with twin-gear drive, illustrates the recently added line of double-crank steel presses of welded construction built by the Henry & Wright Mfg. Co., Hartford, Conn.

This press is the shrunk-in, tie-rod type, with the bed, uprights, crown, slide and twin gears made of welded steel, annealed and normalized before machining.

The increased strength of the welded-steel construction permitted the use of stress values sufficiently low to reduce the deflection in the frame members 60 per cent of the amount usually found in the customary cast-iron press of corresponding crank-shaft diameter, and at a substantially lower weight.

Major castings, such as the connections and flywheel, are made from a patented, high-test alloy iron having approximately the same strength as steel castings.



The machine is direct-connected motor driven by a 20 hp. ball-bearing motor, mounted on the left-hand rear bracket, while the slide is arranged for motor adjustment by means of a 5-hp. motor mounted on the slide, which eliminates the use of universal joints between the motor and gear box.

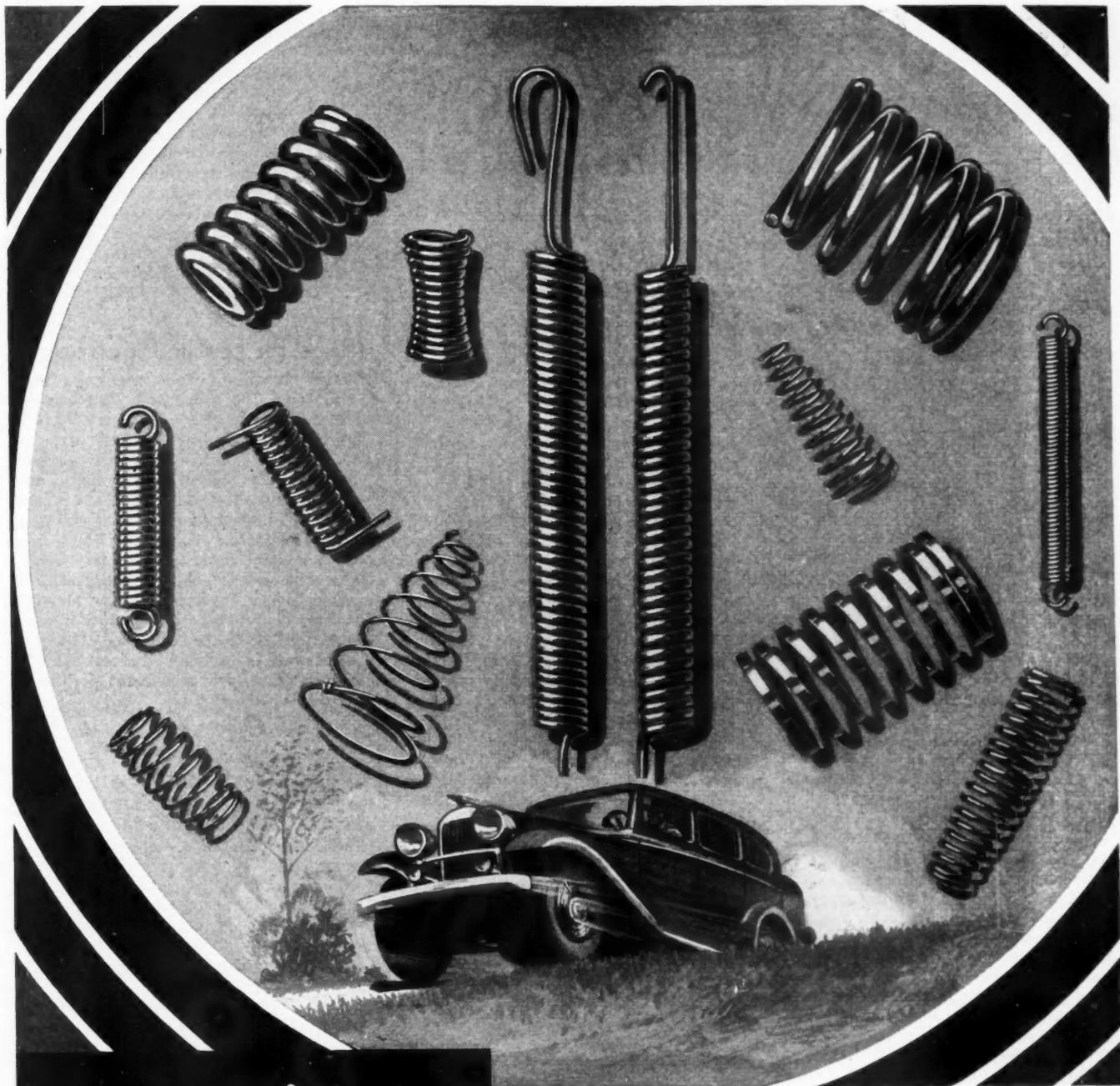
Titeflex All-Metal Fuel Lines

Titeflex Metal Hose Co. of Newark, N. J., has developed a new gas and oil line unit to be used in connection with motors using "floating power" or those that are rubber mounted. This new development in the automotive industry requires a flexible gas and oil line, as it is necessary to absorb considerable movement between the motor and the frame when the power unit is mounted on rubber.

For 16 years the company has specialized in manufacturing all-metal flexible tubing that has been extensively used by the truck, bus and aeroplane industry as a flexible fuel line to absorb vibration. This present development is a new effort by this company to solve this new problem in the pleasure car field.

In solving this problem they furnish an all-metal flexible line, with any standard couplings attached and it is supplied as a complete made up unit to any manufacturer's specifications. Because of its all-metal construction it is very efficient for the carrying of gasoline or oil under pressure.

(Turn to page 610, please)



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NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

New Bronze Welding Rod

Oxweld No. 25 M. bronze patented welding rod, just introduced by the Linde Air Products Co., New York, is recommended by the makers for use in the rebuilding of wear-resisting surfaces such as piston rings or cylinder walls. It is claimed to produce weld metal with superior wear-resisting qualities, and has the added advantage of being non-fuming and exceptionally free-flowing. It is supplied in three sizes: $\frac{1}{8}$ in., $\frac{3}{16}$ in., and $\frac{1}{4}$ in.

Titeflex All-Metal Exhaust Tubing

Titeflex Metal Hose Co., Newark, N. J., is now offering an all-metal exhaust tubing marketed under the name of Titeflex bendable pipe. This tubing is constructed from a .028 heavy metal steel strip.

The edges of the strip are fully interlocked, producing a series of sliding joints which function to make the pipe bendable. These joints are in turn made pressure-tight for exhaust gases with a special metal wire packing, thus producing a bendable pipe of all-metal construction.

Exhaust tubing is subjected to a large amount of heat from the exhaust gases discharging through the tube and therefore the conventional interlocked type of tubing as an exhaust pipe is limited due to the deterioration and blowing out of the fibrous or composition packing.

Titeflex bendable pipe, with its all-metal construction, including the packing used in the full interlocked joint is tight for carrying exhaust gases. It can be bent within its limits without the use of special tools. Fittings can be attached by welding or brazing on the couplings. It is furnished in quarter-inch sizes ranging from $1\frac{1}{4}$ in. I.D. up to and including 4 in. I.D.

Mathews Conveyor Uses Own Device

A practical test has been made applying three pairs of Mathews ball transfers originally described in *Automotive Industries*, July 25, 1931, in such a position as to handle various diameter rounds and tubing for feeding a cut-off machine. This test, now six months old, has proven so successful that the manufacturers, the Mathews Conveyor Co., Ellwood City, Pa., have decided to pass this feature along to other interested people.

Enlarged Line of Compressors

The Gardner-Denver Co., Quincy, Illinois, announces an increase in the range of sizes of its single cylinder, single stage air cooled compressors to include machines from $2 \times 1\frac{1}{4}$ to $3\frac{1}{2} \times 4$, and five sizes in a new vertical duplex two-stage automatic compressor outfit of 3 to 5 hp.

Features of the single cylinder, single stage compressor include separate crankcase and cylinder; plate valves; roller bearings; large area cooling fins on cylinders and cylinder head; fan flywheel pulley, and hand unloader for starting purposes.

The vertical duplex two-stage automatic outfit has counterweights forged integral with crankshaft; Timken main bearings; automotive type pistons; plate valves; splash system of lubrication, and double-finned intercooler in direct path of the air blast from fan flywheel. Compressor is good for 200 lb. continuous service.

Westinghouse Gearmotor Speed Reducers

The latest development in compact speed reducers is the line of Gearmotors recently placed on the market by the Westinghouse Electric and Mfg. Co., Pittsburgh, Pa. The most prominent feature of these drives is the possibility of operating at low motor speeds. Each unit includes a Westinghouse type CS general purpose induction motor and a double

reduction, non-planetary type helical gear speed reducer built onto the one-piece motor frame forming a rigid assembly which is supported entirely by the motor feet. An improvement incorporated in these unit drives is the prewound primary core which is separable from the stator frame.

Gearmotors are built in sizes of $\frac{1}{2}$ to 15 hp. with a wide selection of output ranging from 69 to 1550 r.p.m. A change in the output of any unit speed can readily be made at a small percentage of its initial cost.

Page Hi-Tensile Electrodes

After months of work, the Page Steel and Wire Co., Monessen, Pa., has developed a new type of coated electrode giving quiet operation with little or no sputter. Since the arc is free burning, the molten pool of metal can be readily observed and the amount of metal deposited accurately judged.

The electrode results in deep penetration and extremely sound welds. The strength of the finished weld is equal to that of the base metal with a total elongation of over 30 per cent when pulled to destruction. The finished weld is ductile and also responds readily to heat treatment, if heat treatment is desired.

Handy Governor

Handy Governor Corp., Detroit, Mich., has developed a new model in which the shaft of the governor valve is mounted on a type of needle bearing which was specially developed for the purpose. This increases the sensitivity of the governor. In the new model not only the speed-adjusting screw but also the studs or bolts by which the governor is secured to the engine are sealed against tampering. In cases where it may be desirable to change frequently the speed adjustment of the governor, a lock-and-key protection is provided instead of the seal.

